Research Project No. 34

"Impact of Public Employment Guarantee Strategies on Gender Equality and Pro-Poor Economic Development"

APPENDIX A

Technical Paper #1
SAM—South Africa (SAM-SA)

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Abstract

The present document describes a Social Accounting Matrix for South Africa (SAM-SA) which was developed as a part of the Levy Economics Institute research project "Impact Analysis of Public Employment Guarantee Strategies on Gender Equality and Pro-Poor Economic Development". The SAM-SA is based on earlier work (SAM 2000) of the Provincial Decision-Making Enabling team (PROVIDE), Department of Agriculture, Elsenburg University, South Africa. Collaboration between the Levy Institute and the South African team led to harmonized SAM-SA and Time Use Satellite Accounts (TUS) for the year 2000, a process this document describes in some detail. Given the focus of our research, gendered disaggregation of labour factors as well as a new household classification was necessary for carrying out policy simulation analysis. The results of the simulations are presented in the main project report document titled, "Scaling up the Expanded Public Works Programme: A Social Sector Intervention Proposal". This technical paper (appendix A) consists of a description of data sources; household and labor factor accounts; assumptions and methodologies used in constructing the datasets; and preliminary descriptive findings from the harmonized SAM-SA and time use data. The reformulated Social Accounting Matrix was further 'adjusted' to incorporate EPWP program-specific linkages to the economy (within the context of social accounting matrix analysis). A novel technique employed in this regard is described briefly in chapter 9 of this document. More detailed information can be found in appendix D.

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Executive Summary

This report provides a technical description of the development of an input-output Social Accounting Matrix (SAM) for South Africa and related satellite accounts for the base year 2000. The report also presents characteristics of representative household and labour groups as it emerges from the Income and Expenditure Survey, the Labour Force Survey and the Time Use Survey, as well as a description of the economic relationships in the South African economy as reflected by the SAM and satellite accounts. The input-output SAM is based on the national PROVIDE SAM for 2000, developed as part of the PROVIDE Project and follows similar methods of construction. The main feature of the current SAM is that it is an input-output SAM (compared to a supply and use SAM) and it contains a complete revision of the household and factor groups compared to the PROVDIE SAM. The new household and factor groups were selected to support research with regard to the impact of public employment guarantee strategies on gender equity in particular, and on pro-poor economic development in general, by exploring the synergies between Employment Guarantee Schemes (EGS) and unpaid work, including unpaid care work.

The point of departure for the development of the SAM is a National Accounting Matrix (NAM) for South Africa. Statistics South Africa was the main supplier of data for the detailed SAM, while data were also obtained from the South African Revenue Service (SARS) and the South African Reserve Bank (SARB). The values for the National Accounting Matrix (NAM) were obtained from the SARB quarterly bulletins. Data from different sources provide the initial estimates for the SAM. Data are usually neither complete nor consistent, therefore the result is a SAM that is not balanced, i.e., the row and column totals do not equate. An important part of the development of a SAM is therefore to estimate missing information and thereby balance the SAM. Entropy estimation techniques are used in the estimation and balancing process. The theory and practical implementation of the estimation techniques are discussed in this report.

The report discusses the structure of the SAM and highlights the differences between a supply and use SAM with explicit commodity and activity accounts, and a reduced from input-output SAM containing production accounts which are classified by commodity. The SAM is initially developed as a supply and use SAM with explicit commodity and activity accounts, and at the final stage the reduced form input-output SAM is derived. The discussion in the report therefore follows the development of a supply and use SAM and mentions the method that was followed to derive the reduced form input-output SAM.

The input-output SAM for South Africa has 96 accounts, which can be grouped into 6 broad aggregates – production accounts (26), factors (25), institutions (41), capital (2) and international trade (1). The institutions consist of sub-aggregates – households (36), incorporated enterprises (1) and government (4). The production accounts are aggregates of the accounts included in the supply and use tables for South Africa published by Statistics South Africa. Deviations from the published supply and use table accounts include the addition of an account for domestic services and the disaggregation of the account for General Government into two new accounts, namely Education and Other Government Services, and the disaggregation of the account for Health and Social Work into two new accounts, namely Health Care and Social Care. Government tax accounts include net commodity taxes, net production taxes and direct taxes on households and enterprises.

The household and factor groups of the SAM are formed using data from the combined household Income and Expenditure Survey for 2000 and the Labour Force Survey for September 2000 conducted by Statistics South Africa. Household groups are formed around an indicator of the geographical location of the household (rural and urban, with rural split further into 'commercial' and 'ex-homelands', and urban split further into formal and informal areas), the race of the household head (African, Coloured/Asian and White) and an income indicator (ultra poor, poor, lower middle income, upper middle income and high income). African households are split into female- and male-headed households. The labour factors in the SAM are split according to province of residence, gender and education level. Three education cohorts are formed, namely people with no education through Grade 10, those with a matric certificate (Grade 12) and those with any form of tertiary qualification (diplomas, certificates or degrees).

There were approximately 43 million people in South Africa in 2000. The bottom two household groups are formed around the 25th and 50th per centiles of per capita income; hence by construction 50 per cent of the population is defined as poor, of which half are defined ultra poor. Poverty, as defined here, is especially prevalent in the former homelands areas where 78 per cent of the population is poor, and among Africans, 61 per cent of whom live in poverty. Average per capita incomes in the bottom two household groups are R1 160 and R2 784 per annum respectively. Average income levels rise dramatically in the non-poor household groups, ranging from R6 502 in the lower middle income group (50th to 75th per centiles), R17 616 in the upper middle income group (75th to 90th per centile) and R70 506 in the high income quintile (90th per centile and above). This attests to the immense inequalities in living standards that persist in South Africa.

There were approximately 11 million employed individuals in South Africa in 2000. About two-thirds of the employed fall in the category of zero education up to Grade 10, while 20 per cent have a matric certificate and 14 per cent have some form of tertiary qualification. Unemployment rates vary surprisingly little between the bottom two education categories (around 38 per cent using the broad definition of unemployment), but then, as expected, the labour market participation share of adult matriculants is 35 per cent higher than that of the bottom education cohort. Only 14 per cent of people with a tertiary qualification are unemployed, which is well below the 36 per cent national average. While there is clearly a strong correlation between education levels and unemployment rates, the link between unemployment and poverty is as evident. About 63 per cent of labour market participants in the ultra poor household group are unemployed. This rate drops to 49 per cent among the poor, and further to 35, 20 and 6 per cent in the non-poor household groups respectively.

Education is a strong determinant of wage levels, with people in the lowest education group earning on average R16 492 per annum, compared to R41 008 for matriculants and R94 894 for people with tertiary qualifications. On average female wages across all education categories are about 38 per cent lower than that of men, despite average working hours of females being only 8 per cent lower than that of men. Female unemployment rates are also significantly higher, averaging 41 per cent compared to 31 per cent among males.

From the national accounting matrix (NAM) for South Africa it can be seen that gross domestic product at market prices was R920 681 million in 2000, with 49.7 per cent accruing to labour services, 41 per cent accruing to capital and the remaining 11.1 per cent accounted for by net taxes on products (R83 933 million) and production (R18 146 million). Imports accounted for 9.5 per cent of total supply of R2 414 billion (measured at consumer prices), with the remaining 90.5 per cent of supply produced domestically. The demand for commodities as intermediate inputs accounted for some 52.3 per cent of total demand for commodities; domestic final demand accounted for 37 per cent and exports for 10.6 per cent. Although South Africa was a net exporter of goods and services from the rest of the world in 2000 (R27 250 million), the total factor and institutional expenditures to the rest of the world (-R28 442 million) caused it to run a net deficit on the current account of R1 192 million. Gross domestic investment was R139 619 million (15.2 per cent of GDP), and this was complemented by a small increase in stocks, R7096 million, giving total investments of R146 715 million.

From the input-output SAM it shows that 52.4 per cent of total demand in South Africa in 2000 was for intermediate use, 37.0% for domestic final consumption and 10.6 per cent for exports. Sources of household income include income from labour services (63.1 per cent),

with the remainder coming from capital services (13.6 per cent), inter household transfers (2.8 per cent), enterprises (16.1 per cent) and transfers from government (4.3 per cent). Expenditures were dominated by current consumption, 83.3 per cent.

The satellite account data from the Labour Force Survey of September 2000 on hours worked by each factor group per production sector reveals that forty five per cent of all female employees with low education (none to GET level) are employed in the Other Services sector, and this group also represents 39 per cent of the work force employed in Other Services. As expected, the male dominated industries are Mining and Construction with, respectively, 97 and 94 per cent of the work force being male.

Results from the Time Use Survey for 2000, which reports information for 14 272 individuals, indicates that females with matric from the Limpopo and Mpumalanga Provinces spend the highest amount of time per day on non-SNA production, at an average of 283 minutes per day, whilst males with matric from the Western Cape and Northern Cape provinces spend the least amount of time per day on non-SNA production, at an average of 62 minutes per day. For all factor groups, males spend far less time than their female counterparts on non-SNA production. The results confirm that females spend more time than males on unpaid work, or non-SNA production. At a household level the overall pattern that emerges is that the lower the household income level, the greater the average amount of time spent per day on non-SNA production is likely to be. Conversely, households with higher income levels are likely to spend less time on non-SNA production. One reason for this pattern is that as household income increases, the household is more able and likely to employ someone to perform the necessary non-SNA production activities on their behalf. The one exception to this pattern is for rural commercial whites. The general pattern for this household group is reversed, with those with a high level of income spending the most amount of time per day on non-SNA production and those with lower income spending the least amount of time per day on non-SNA production.

1. Introduction

This report discusses the technical aspects of the development of an input-output Social Accounting Matrix (SAM) for South Africa and satellite accounts from the Income and Expenditure Survey, the Labour Force Survey and Time Use Survey for 2000. An overview of economic relationships in South Africa as reflected by the SAM and satellite accounts is also presented. The input-output SAM was developed in response to a request from the Levy Economics Institute at Bard College for a SAM suitable for research with regard to the impact of public employment guarantee strategies on gender equity in particular, and on pro-poor economic development in general, by exploring the synergies between Employment Guarantee Schemes (EGS) and unpaid work, including unpaid care work. The reduced form input-output SAM was based on the 2000 supply and use SAM for South Africa developed as part of the PROVIDE Project (PROVIDE, 2006). Other revisions of the SAM focused mainly on including factor accounts which incorporate a gender dimension and revision of the choice of production accounts in order to highlight production sectors with potential application for employment guarantee programmes. Data from the Time Use Survey was explored for a better understanding of the dimensions of time burden and unpaid work.

The economic information contained in the SAM for South Africa and satellite accounts are for the year 2000. The choice of 2000 as a base year for the SAM stems from the fact that the only Time Use Survey for South Africa available at the time of writing this report is for 2000. The bulk of other information for the development of the SAM, including supply and use tables, data on trade, and household and factor incomes and expenditure, are also available for 2000.

The next section presents an overview of the structure of the SAM, explaining the difference between a supply and use SAM and an input-output SAM, as well as a note on how the input-output SAM was derived from the supply and use SAM. The main data sources that were used to construct the SAM are described in section 3. Section 4 is a discussion of the considerations in deciding the representative household and factor groups that should be included in the social accounting matrix and some descriptive statistics on households and labour derived form data from the Income and Expenditure Survey and Labour Force Survey. The results presented in this section provide some general background information that might be useful in further analysis and does not necessarily follow the accounts of the SAM. A short note on the compilation of the matrices that are included in the SAM is also provided. A discussion of the treatment of the Time Use Survey data follows in section 5. Section 6 presents an overview of the compilation of the national accounts matrix (NAM) for South Africa from data from the South African Reserve Bank, which provides the control totals for

the sub-matrices of the detailed SAM. The development of the detailed SAM in section 7 explains which control totals are used in combination with which shares/structural information (from e.g. the Income and Expenditure Survey and Labour Force Survey) in order to derive an initial detailed SAM. The sub-matrix totals of the initial SAM will be consistent with the sub-matrix values of the NAM as a result of using the NAM values as control totals. However, because of data inconsistencies, the row and column totals of the detailed SAM will not be equal as per (SAM) definition they should be, hence an estimation procedure is required to derive a complete and consistent SAM. A summary of the cross entropy estimation procedure that was used is presented in section 8. Economic relationships in South Africa as reflected by the input-output SAM and the satellite accounts are discussed in section 9. The final section presents some concluding comments. The SAM accounts and the phase configure mappings used during the cross entropy estimation process are listed in the appendix.

2.   Main structural features of the input-output SAM for South Africa

2.1.   What is a Social Accounting Matrix?

A Social Accounting Matrix (SAM) is a data set in the form of a square matrix in which each account has both a row and a column. The column entries record the expenditures/payments/out-goings for each account, while the incomes/receipts/in-comings for each account are recorded as row entries. As such a SAM represents a form of double entry bookkeeping where each entry is a transaction which identifies both the source and destination of the transaction. Total expenditures by each account must be exactly equal to the total receipts for each account, hence the respective row and column sums for a SAM must equate. Consequently a SAM provides a complete and consistent set of information about an economic system for a given year in an efficient and simple way. Moreover, it will provide that information in a manner that is consistent with the aggregate/macro accounts for the system. In the context of an entire economy, a SAM will contain not only the information provided by the national accounts but also further details on the transactions between various groups of agents within the system. For a theoretical discussion of Social Accounting Matrices see PROVIDE Background Paper 2003:4 (PROVIDE 2003).

2.2.   General account structure of a supply and use Social Accounting Matrix

Table 1 is a representation of a SAM which broadly follows the System of National Accounts (SNA) for 1993. The major difference between this SAM and an SNA 1993 SAM is in the treatment of the distribution of income. The SNA 1993 uses a two-stage mapping, first and

second stage distribution of income[1]. There are many alternative ways to layout a SAM. In general however SAMs are constructed with 7 types of account and each type may contain numerous (sub) accounts:

- Commodity accounts
- Trade and transport margins
- Activity (or production) accounts
- Factor accounts
- Institutional accounts
- Capital accounts
- Rest of the World accounts.

2.3.   Deriving an input-output SAM for South Africa

The layout of the SAM in Table 1 conforms to the class of supply and use SAMs, with explicit commodity and activity accounts. The national accounts matrix (NAM) and the detailed input-output SAM are initially developed according to supply and use principles and in the final stage of development the detailed SAM is reduced to an input-output SAM, because the main use of this SAM is for application in structural path analysis based on an input-output theory.

The reduced form input-output SAM was derived following the method of apportionment discussed in Pyatt (2001), following a commodity by commodity (as opposed to an activity by activity) production structure as recommended by the SNA (1993) (paragraph 15.150). The commodity-by- commodity table shows which commodities are used in the production of which other commodities; whereas an activity-by- activity table would show which activity uses the output of which other activity. According to the SNA 'the product-by-product table will often prove most useful'. The NAM derived from the final input-output SAM is shown in Table 29. A list of accounts of the input-output SAM appears in Table 42 to Table 45 in the appendix.

Further adjustments of the input-output SAM for purposes of the structural path analysis model include the absorption of the trade and transport margins into the production block, and transposing negative row entries, such as net subsidies, to the corresponding columns, hence making them positive.

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[1] The 1998 National SAM by Statistics SA is an example of a SAM that follows the SNA.

Table 1: Schematic of a national supply and use SAM

	Commodities	Activities	Factors	Household	Enterprises	Government	Capital	Rest of World	Account Total
Commodities	Marketing Margins	USE Matrix		Household Consumption		Central Government Expenditure	Investment Expenditure and Stock Changes	Exports of Goods & Services	Commodity Demand
Activities	SUPPLY Matrix								Production
Factors		Remuneration of Factors						Factor Income from RoW	Incomes to Factors
Households			Distribution of Factor Incomes	Inter Household Transfers	Distribution of Enterprise Income	Transfers to Households		Remittances from RoW	Household Income
Enterprises			Distribution of Factor Incomes			Transfers to Enterprises		Enterprise Income from RoW	Enterprise Income
Government	Commodity Taxes	Production Taxes	Factor Taxes	Hhold Income Tax & Transfers to Government	Ent Income Tax & Transfers to Government			Current Transfers from RoW	Government Income
Capital			Depreciation	Household Savings	Enterprise Savings	Government Savings	Total Stock Changes	Capital Account Balance	Savings
Rest of World (RoW)	Imports of Goods & Services		Factor Payments to RoW	Remittances to RoW	Enterprise Payments to RoW	Current transfers to RoW		Re-exports	Imports of G&S from RoW and Transfers to RoW
Totals	Commodity Supply	Cost of Production	Expenditure on Factors	Household Expenditure	Enterprise Expenditure	Government Expenditure	Investment Expenditure	Exports of G&S to RoW and Transfers from RoW	

3. Main data sources

Table 2 gives an overview of the main data sources used for each type of account included in the SAM for South Africa.

Table 2: Data sources for each type of account in the SAM

Type of account	Statistical sources
Commodity and activity accounts	2000 SU-tables (SSA, 2003) 2002 SU-tables (SSA, 2006) Statistical Release P0441 November 2004 (SSA, 2004a) SARB Quarterly Bulletin (SARB, December 2004)
Factor accounts	2000 SU-tables (SSA, 2003) 2002 SU-tables (SSA, 2006) 2000 Income and Expenditure Survey (SSA, 2002a) 2000 Labour Force Survey (SSA, 2002b) SARB Quarterly Bulletin (SARB, December 2004)
Satellite accounts	2000 Income and Expenditure Survey (SSA, 2002a) 2000 Labour Force Survey (SSA, 2002b) 2000 Time Use Survey (SSA, 2001)
Household accounts	2000 Income and Expenditure Survey (SSA, 2002a) 2000 Labour Force Survey (SSA, 2002b) SARB Quarterly Bulletin (SARB, December 2004)
Corporations / Enterprises	2000 Income and Expenditure Survey (SSA, 2002a) SARB Quarterly Bulletin (SARB, December 2004)
Government accounts	SARB Quarterly Bulletin (SARB, December 2004) 2002 SU-tables (SSA, 2006)
Capital accounts	2002 SU-tables (SSA, 2006) SARB Quarterly Bulletin (SARB, December 2004)
Trade	2000 SU-tables (SSA, 2003) 2000 Import and export data (SARS, 2000) SARB Quarterly Bulletin (SARB, December 2004)

3.1. South African Reserve Bank Quarterly Bulletin

The Quarterly Bulletin of December 2004 published by the South African Reserve Bank (SARB, 2004) provided the bulk of the data for the NAM described in section 0. The statistical tables published in the Quarterly Bulletins contain data on money and banking, the capital market, the national financial account, public finance, international economic relations, national accounts, general economic indicators and other key information. The tables used to determine the values for the NAM are National Government Finance (S-54), Balance of payments (S-86), Services, income and transfers (S-90), National income and production accounts of SA (S-112), Financing of gross capital formation (S-132), Current income and expenditure of incorporated business enterprises (S-135), Current income and expenditure of general government (S-136) and Current income and expenditure of households (S-137). The figures in the quarterly bulletin enter directly into the NAM, discussed in section 0.

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3.2. Statistical Release P0441, November 2004

A key figure for a NAM, which is not published in the Quarterly Bulletin of SARB, is gross output by activities. The annual production accounts, Table 12 of Statistical Release P0441 published by Statistics South Africa (SSA, 2004), provides an estimate of gross output at basic prices. Statistical Release P0441 contains aggregated supply and use tables for each year from 1997 until 2003. The tables contain only nine industry and nine commodity categories. These supply and use tables were compiled after the benchmarking and rebasing process conducted earlier in 2004 (see next section). The values of the supply and use tables for 2000 therefore differ from those in the detailed supply and use tables discussed in the next section. The data contained in the revised nine-sector supply and use tables do not enter directly into the priors for the SAMs, but they were used to provide control totals during the estimation process (see phase 2 of Table 47). The calculated totals of the sub-matrices of the detailed SAMs were therefore constrained to add up to the values of the nine-sector supply and use tables. See section 8 for more details on the estimation process.

3.3. 2000 and 2002 Supply and Use Tables

The supply and use tables (SU-tables) for South Africa (SSA, 2003 and 2006) report the value of transactions in goods and services in the South African economy for a specific year in matrix format. The SU-tables serve as a co-ordinating framework to ensure the numerical consistency and accuracy of national data obtained from different sources i.e. industrial surveys, household surveys, investment surveys and foreign trade statistics. According to the compilers the SU-tables are completely reconciled with the national accounts estimates of gross domestic product (GDP) by activity and the expenditure on GDP, but there are still significant discrepancies between the supply and use of products at a more detailed level. Firms are assigned to activities according to the principal product of the firm. Therefore activities are defined by commodity definitions. The activities included in the SU-tables by Statistics SA follow the 1993 Standard Industrial Classification (SIC) (CSS, 1993). The only commodity for which there is no corresponding activity is Financial Services Indirectly Measured (FSIM). The commodity and activity lists are well documented by Statistics SA (see SSA, 2003) and serve as a point of departure for the commodity and activities included in the SAM. Table 46 in the appendix provides the activity list and corresponding SIC codes which, when read together with the SIC descriptions (CSS, 1993), can be used to get an indication of what is included in each category. Deviations from the classifications as found in the reports on the SU-tables, for purposes of this project, are documented in section 7.2.

During 2004 a process of benchmarking and rebasing from 1995 to 2000 was undertaken and the GDP estimates and aggregated (nine sector) SU-tables (SSA, 2004) were revised using new and additional information, but detailed SU-table were revised only from year

2002 onwards. It was hence decided to use the detailed structural information from the 2002 SU-tables (SSA, 2006), instead of the 2000 SU-tables (SSA, 2003), as the 2002 data were deemed more reliable and consistent with the revised nine-sector SU-table for 2000.

The use table allocates the expenditure by 94 industries on intermediate inputs of 95 different commodities, or groups of commodities. The use table also reports the value of final demand for each of the commodities with regard to exports, household and government consumption expenditure, fixed capital formation and changes in inventories respectively. The use table further reports gross value added, compensation of employees, net taxes and gross operating surplus for each industry. The use table reports a residual that indicates the discrepancy between the value of supply and use for each commodity. These residuals sum to zero, but are substantial for individual commodities. These residuals are not explicitly eliminated during the process of deriving a prior SAM, but are dealt with as part of the process of estimating missing information as discussed in section 8. Intermediate and final consumption expenditure is valued at purchasers' prices in the 1993 System of National Accounts. The use table presents the use of products at purchasers' price (SSA, 2006). The purchasers' price is defined as the amount paid by the purchaser, excluding any deductible value added tax (VAT) or similar deductible tax, in order to take delivery of a unit of a good or service at the time and place required by the purchaser. The purchaser's price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place.

The supply matrix (SSA, 2006) indicates the values of 153 products produced by each of the 94 activities. For purposes of the PROVIDE SAM these 153 products were aggregated to the 95 commodity groups used in the use tables and in the 1998 and 1999 versions of the supply table. Entries in the off-diagonal elements of the supply matrix are only found in cases where multiple products are produced by an activity. The supply matrix also records imports, trade and transport margins and net taxes for each commodity. Output is valued at basic prices in the 1993 System of National Accounts. The supply table presents the supply of products at basic prices. The basic price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable plus any subsidy receivable on that unit as a consequence of its production or sale. Basic prices exclude any transport charges invoiced separately by the producer. The total supply of products at basic prices can be divided according to its origin, i.e., whether the products are domestically produced or imported (SSA, 2006).

The SU-table information enter directly into the detailed supply and use matrices of the SAM by multiplying the ratios of each table with the total figures for the supply and use matrices as reported in the NAM. The information reported in the use table on stocks,

investment and gross operating surplus (GOS) were used directly. The information on imports and exports and household consumption were not used; the trade data from SARS and the 2000 Income and Expenditure Survey were used instead.

3.4. 2000 Income and Expenditure Survey

Data from the Income and Expenditure Survey of 2000 (IES 2000) (SSA, 2002a) are used to form representative household groups that form the household accounts of the SAM (see section 4) and provide the bulk of household information that enters the SAM. The IES 2000 is conducted by Statistics South Africa every five years and records the detailed income and expenditure of households. In total there are approximately 900 questions in the IES 2000 questionnaire covering all income and expenditure-related activities of households during a particular period. These surveys were originally designed, and are still used, to determine weights for the South African Consumer Price Index. However, being the only survey of its type in South Africa, the IES is also used by social scientists and policymakers researching the earning and spending capacity and expenditure patterns of South African households. It forms an important data source for the household expenditure matrix in the SAM, as well as various other cells or sub-matrices in the SAM containing information on income or expenditure activities of households.

Originally some 30 000 households were interviewed for the IES 2000, but many records were dropped by Statistics South Africa from the dataset due to data problems such as incomplete questionnaires. The official Statistical Release P0111 included 26 309 households, and after some further 'cleaning', which formed part of the PROVIDE Project's work during 2004, 26 183 households remained in the final dataset on which the household account data in the SAM is based[2].

Individual households in the IES 2000 were linked to households and their members in the Labour Force Survey of September 2000 (LFS 2000:2) in order to map factor income data with households[3]. Not only is the IES 2000 based on the same set of households interviewed for the LFS 2000:2, but they were also conducted at around the same time in 2000, which makes the merging of the IES 2000 and LFS 2000:2 possible. The survey sampling weights provided with the IES 2000 and the LFS 2000: 2 were used throughout to correct for any sampling bias introduced in the estimation of total incomes and expenditures of household and factor groups.

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[2] See PROVIDE Technical Paper 2005:1 for details on how the final IES 2000 dataset was created.
[3] See PROVIDE Technical Paper 2005:1 for details on how the merged IES/LFS 2000 dataset was created.

3.5. 2000 Labour Force Survey

The Labour Force Survey of September 2000 (LFS 2000:2) (SSA, 2002b) was used to obtain employment data for the SAM. The LFS, which is conducted twice every year, replaced the October Household Surveys, which were conducted annually until 1999. The LFS includes data on respondents' occupation groups, industries in which they are employed and wages or salaries earned during a specific period, as well as personal information such as gender, age, etc. Eleven main occupation groups are identified, ranging from legislators, senior officials and managers to elementary occupations, while 50 main industries are defined. Although the IES 2000 also contains such employment data the LFS 2000:2 was preferred for a number of reasons.

- The LFS 2000:2 and IES 2000 are designed so that they can be merged, i.e., households in the IES 2000 can be linked to the same households in the LFS 2000:2 because the same households were interviewed for both surveys.
- Since information on education level of labour contained in the LFS 2000:2 had to be extracted and linked to the IES 2000 to create a matrix of labour ownership by household, the LFS 2000:2 employment data were available within the IES 2000 dataset.
- Since the LFS 2000:2 is designed specifically to gather information on employment and related activities of the population, the quality of the data is presumed to be better. For example, the IES 2000 only asks a single question to determine a person's occupation or industry code. In contrast, occupation and industry codes in the LFS 2000:2 are based on a series of questions. Consequently there are fewer 'unspecified' factors and industries in the LFS 2000:2, which suggests that the information supplied can be used to determine more accurately what the correct factor or industry codes should be.

Individual households in the IES 2000 were linked to households and their members in the Labour Force Survey of September 2000 (LFS 2000:2) in order to map factor income data with households[4].

3.6. 2000 Trade Data

Import and export data were obtained from the South African Revenue Service (SARS, 2000). Trade data were sorted according to the type of product. Products were assigned a 9-digit tariff, where the first eight digits correspond to the codes used in the Harmonised System of Accounts (HS). The data therefore had to be mapped firstly to the Standard Industrial Classification (SIC) codes (CSS, 1993) and then to the 95 commodity accounts included in the SAM. The mapping (Kuhn, 1999) is not included in the Appendix due to its length. For

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[4] See PROVIDE Technical Paper 2005:1 for details on how the merged IES/LFS 2000 dataset was created.

details on the method of organising trade data for inclusion in a Social Accounting Matrix refer to PROVIDE Project Technical Paper 2004:2 (PROVIDE 2004).

3.7.   2000 Time Use Survey

The time use survey of 2000 (TUS 2000) (SSA, 2001) provided the bulk of data that was used to estimate the average amount of time spent on various paid and unpaid activities by different workers in different household types. This section provides an overview of the time use survey, and in essence summarises the most salient aspects of the report *"A survey of time use"* (SSA, 2001). The time use survey was the first national time use study to be conducted in South Africa. The overall objective of the survey was to provide information on how individual South Africans spend their time. A particular focus of the study was on gender equity, and the survey sought to provide greater insight into the division of both paid and unpaid labour between men and women. The survey also intended to provide more detailed information on less well documented productive activities including casual work, subsistence work, and work in the informal sector.

The survey was conducted in three rounds (tranches) in order to capture potential seasonal variations in time use. These rounds were carried out in February, June and October 2000. The sample covered all nine of South Africa's provinces, and within each province, four different settlement types were covered, these being: formal urban, informal urban, commercial farms and other rural settlements.

The first section of the survey consisted of a household questionnaire, containing many of the standard questions used in Stats SA household surveys. This section was included by Stats SA in order to allow for comparison across surveys. One member per household was required to provide this basic information about the household as a whole. After completing the first section of the questionnaire two people, aged ten years or above, from each household were systematically selected and questioned about the activities they had performed the previous day. A limitation of the dataset is that the way the data is recorded does not allow one to identify the household head. Each respondent was also required to provide basic demographic information about themselves, for example their age, gender, race, education level and work status. The activities performed by each respondent were recorded in a 24-hour diary, which had been divided into half-hour slots. A maximum of three activities could be recorded for each time slot.

The planned sample for the survey was 3 600 dwelling units per tranche, resulting in 10 800 dwelling units in total. However, the realised sample was smaller than planned at 8 564 households and 14 553 respondents. The full sample was not realised primarily because of unoccupied dwelling units as well as dwelling units that appeared on maps but which were

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not found on the ground.

The time use survey utilised a trial classification developed by the United Nations (UN) Statistics Division to code the activities recorded in the time slots. A common perception regarding existing classification systems was that they were biased towards a first world situation, and the UN system was developed in response to this perception. The UN system attempts to provide a more detailed classification of economic activities, especially for informal activities.

The international System of National Accounts (SNA), which is used to calculate various macroeconomic indicators such as gross domestic product (GDP), takes certain productive activities into account, but does not account for activities that occur outside of the paid economy. The term 'reproductive' activity refers to activities such as cooking, cleaning, and caring for children and other household members. These activities are most likely to be performed by women, whilst men are more likely to produce goods and services for the market economy. Whilst many reproductive services have an equivalent in the market economy, the majority of these activities are provided on an unpaid basis. The time use survey provides data on activities produced outside the paid economy, and therefore establishes a foundation for the elaboration of GDP through parallel national accounts.

The UN classification system consists of the following ten broad categories:
1. Work in establishments, for example working in a factory, mine or for government;
2. Primary production, for example growing fruit or vegetables on a household plot;
3. Work in non-establishments, for example street vendors, or hair salons run from home;
4. Household maintenance, for example cleaning the home and cooking;
5. Care of persons, for example caring for ill or elderly people in the household, or looking after children;
6. Community service, for example helping other households or attending a political meeting;
7. Learning, for example work-related training or attending school;
8. Social and cultural, for example participating in religious activities or socialising with friends and family;
9. Mass media use, for example visiting the library or watching television
0. Personal care and self-maintenance, for example sleeping, washing and dressing.

These ten activities can be grouped according to their treatment in the SNA, and thus in the calculation of GDP. Specifically, activities 1-3 fall inside the SNA production boundary, and would thus be included in the national accounts and GDP calculation. The time use survey report refers to these as 'SNA production'. Although activities 4-6 are widely

recognised as productive activities, they fall outside the SNA production boundary, and generally correspond to unpaid work. These are referred to as 'non-SNA production' in the time use report. Activities 7-0 fall outside the SNA production boundary. These activities fail the 'third person test', because it is not possible for them to be performed for a person by someone else. Therefore, it is not possible for them to become part of the market economy. The time use report refers to these activities as 'non-productive activities'.

The SSA time use survey differs from that of many other countries because, although it allows for three activities to be recorded per half hour, it does not ask respondents to distinguish between primary, secondary and tertiary activities. The activities performed in each time slot are given equal importance. Although the time use surveys of other countries also allow for multiple activities to be performed in a given time slot, they differ from the South African time use survey in that the respondent is asked to prioritise these activities. The approach where respondents are asked to prioritise activities is problematic for a number of reasons. Firstly it has been shown that there is a systematic bias in what activities are prioritised by respondents and secondly because analysts are prone to disregard all but the primary activity. Specifically, activities such as child care are usually given a lower priority than other simultaneous activities.

The SSA time use survey provided for both simultaneous (i.e. those performed at the same time) and sequential (i.e. those performed one after the other within the time slot) activities. SSA used two different methods to assign minutes to activities in the time use survey. Where only one activity was performed in a particular time slot, this activity was allocated 30 minutes. Where two activities were performed *sequentially* in a particular time slot, each activity was assigned 15 minutes. Similarly, when a time slot consisted of three activities performed *sequentially*, each activity was allocated 10 minutes. However, the decision on how best to allocate minutes to activities was more complicated when two or more activities were performed *simultaneously*. As an example, if two activities were performed *simultaneously* in a particular time slot, it was unclear whether it was best to allocate 15 minutes or 30 minutes to each activity. The method whereby each of the two activities is allocated 15 minutes, or equivalently where each of the three activities is allocated ten minutes, is termed the *total minutes* approach. An advantage of this method is that it ensures that the total minutes spent per person per day on all activities sums to 24 hours. *The majority of analysis and tables presented in the SSA time use report utilise the total minutes approach.* The method whereby the two or three activities are each allocated 30 minutes is termed the *full minutes* approach. The advantage of this method is that it gives a more accurate indication of the actual duration that a particular activity spanned.

4. Forming representative household and factor accounts for the SAM

4.1. Overview

A key focus during the development of this SAM was to derive new representative household and factor groups to be included in the SAM, compared to the PROVIDE SAM (PROVIDE, 2006a) that was used as a base. All the demographics and geographic data, as well as information on household income and the labour market status of individuals used to form household and factor accounts are sourced from the Income and Expenditure Survey of 2000 (IES 2000) (SSA, 2002a) and Labour Force Survey of September 2000 (LFS 2000:2) (SSA, 2002b). This merged dataset (referred to as IES/LFS 2000) contains comprehensive data on income and expenditures of households as well as wages and wage distribution. The merged dataset was created and used as part of the development of the PROVIDE SAM and a detailed description of the data, the process of merging the two datasets, the process of extracting and reorganising the data, as well as further data analysis and adjustments are fully documented in the PROVIDE Technical Paper 2005:1 (PROVIDE, 2005a) and is not repeated here.

The data that were extracted from the IES/LFS 2000 to construct data matrices for inclusion in the SAM cover all the relevant sub-matrices in the factor (labour) and household rows and columns of the SAM. The consideration in determining the representative household and factor groups and the characteristics of the groups are presented in this section, as well as a short description of the steps taken in constructing the data matrices that were extracted specifically for purposes of the SAM and satellite accounts. The matrices were extracted from the IES/LFS 2000 using cross-tabulation commands based on the new factor and household classifications. The methods followed to incorporate the data matrices on households and factors into the SAM are discussed in section 7. While selected results from the SAM and satellite accounts are presented in section 10.

4.2. Considerations when forming representative household and factor accounts

When forming representative accounts in a SAM, such as factor or household groups, some basic guidelines need to be followed. Firstly, one has to decide on the appropriate level and extent of account disaggregation. This is often dictated by the quality of the data and the reliability of estimates: the smaller the sub-sample on which estimates of income and expenditure flows of an account are based, the less reliable that estimate is likely to become, especially if the sub-sample contains any outliers. Thus, while more accounts are always better (one can always aggregate the SAM once accounts have been formed, and not the other way around), the sample size remains a real constraint. The challenge is to find the right

balance between detail in the SAM and reliability of estimates.

Secondly, one should attempt to group individual factors or households that are fairly similar (or homogenous) in terms of how they would respond to economic shocks and interact with other agents in the economy. In particular, for household and factor accounts, representative groups should (1) correctly reproduce the socio-economic stratification within the society and the economy; (2) be composed of socio-economic groups that are recognisable for policy purposes; and (3) be based on comparatively stable characteristics that are reliable and easily measured (see Decaluwé et al., 1999). Economic theory as well as the 'stylised facts' of the economy at hand with respect to household behaviour and labour market traits therefore form important information sources for forming household and factor accounts for a SAM (see PROVIDE, 2005b, for a detailed discussion).

Practically, of course, it is impossible to form groups of households or factors that are completely homogeneous. In reality individual members of household or factor groups will always differ somewhat in terms of income sources, expenditure patterns, and general behaviour or responses to economic shocks.

4.3. Household Groups

Household groups are formed around an indicator of the geographical location (formal and informal urban areas, 'commercial' rural areas and rural areas forming part of the former homelands) of the household's residence and the race (African, Coloured/Asian and White) of the head of the household. African households are split into female- and male-headed households[5]. Finally, each sub-group is divided further into income groups, using the per capita household income as criterion. Figure 1 gives a diagrammatical representation of how the household groups are formed, while the discussion below elaborates.

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[5] This split did not enter into the final version of the SAM, as a more aggregated SAM was required for the analysis.

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Figure 1: Household Group Formation in the SAM
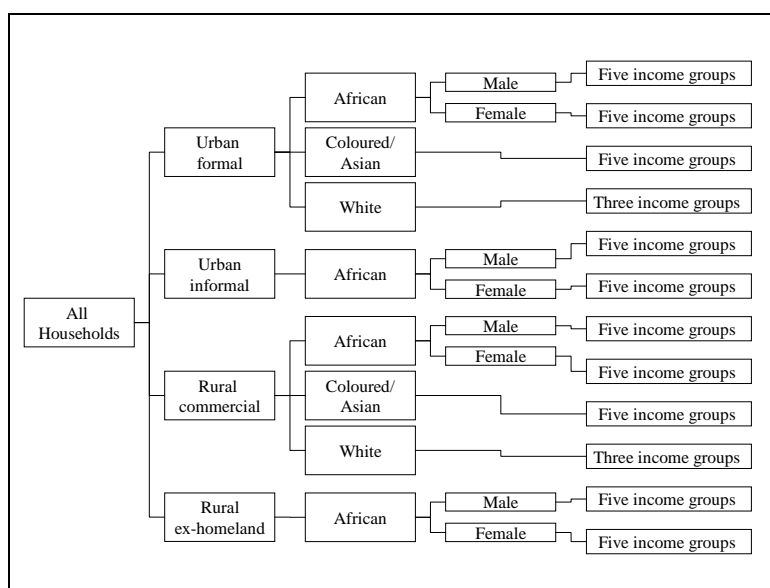
4.3.1.   *Location*

The geographical location variable (*hhstrata*) is based on the strata used in the sampling process in the Time Use Survey of (TUS 2000) (SSA, 2001).[6] The first major division is the rural-urban split, with urban households further divided into formal and informal. Here informal refers to the type of housing in which the household lives, and not to any formal or informal labour market participation by the household. Formal urban residential areas include traditional residential suburban areas and city or town centres. Residents in these areas are typically middle-income or wealthy households. Informal areas, on the other hand, include so-called squatter camps and shanty towns. Households may live in a variety of informal dwellings (for example shacks or huts) and are generally classified as poor or very poor. Linkages to formal employment are also weaker than in formal areas.

Rural households are divided into households living in areas demarcated as commercial farms or rural areas where commercial activities (such as mining) take place. As such 'rural commercial' households are not necessarily themselves involved in agricultural or mining activities although they very often are, either directly or indirectly. The remainder of rural areas in South Africa basically make up what was formerly known as the homelands or Bantustans in South Africa. During the 1960s and 1970s the South African government, as part of their Apartheid policy, set aside various areas known as homelands. The homelands were reserved for Africans of specific ethnic groups, depending on the geographic positioning

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6   Household groups formed for the SAM are dictated to some extent by the type of household-level information available in the TUS 2000 in order to allow analyses of time use by SAM household groups. The IES/LFS 2000 and TUS 2000 cannot be merged, hence the cohort approach.

and dominant ethnic group of the region. Today the majority of the population in the former homelands are still African.

Figure 2 shows the ten homelands areas that existed in South Africa. The Transkei, Boputhatswana, Venda and Ciskei (collectively referred to as the TBVC states) were the most prominent of the homelands. Homelands were either partially self-governed or in some cases independent from the Republic. The former homelands areas constitute less than 13 per cent of the total land area of South Africa, but is still today home to 27.1 per cent of the population and more than one third of all Africans living in South Africa (PROVIDE, 2005b). Given decades of under funding, poor management, and economic and geographical isolation, it can be expected that households in homelands areas will behave differently to economic shocks, hence separating households that currently reside in former homelands areas makes sense from an economic modelling point of view.

Figure 2: Former homelands in South Africa

Source: Unknown

Large parts of what is today the Eastern Cape province contains the former Ciskei and Transkei. Similarly, large parts of KwaZulu-Natal province formerly made up the KwaZulu tribal areas. Large areas in the north-western, northern and north-eastern parts of South Africa, which today forms the North West, Limpopo and Mpumalanga provinces, also formerly consisted of homelands. A comparison of household poverty across these provinces (Table 3) reveals that these provinces, and in particular Eastern Cape and Limpopo, have extremely high poverty headcount rates.

Table 3: Distribution of the Poor and Non-poor People across Provinces (Row Percentages)

	Ultra poor	Poor	Total poor	Non-poor	Total
Western Cape	5.1	17.4	22.5	77.6	100.0
Eastern Cape	41.5	28.1	69.6	30.4	100.0
Northern Cape	19.2	30.0	49.1	50.9	100.0
Free State	30.8	27.0	57.9	42.1	100.0
KwaZulu-Natal	31.0	25.6	56.6	43.4	100.0
North West	25.7	27.2	53.0	47.0	100.0
Gauteng	9.6	18.0	27.6	72.4	100.0
Mpumalanga	23.1	30.5	53.6	46.4	100.0
Limpopo	38.5	31.1	69.6	30.5	100.0
Total	26.2	25.2	51.4	48.6	100.0

Source: IES/LFS 2000 and authors calculations

Since the variable *hhstrata* does not exist in the IES/LFS 2000 it had to be constructed. In the TUS 2000 the strata variable is determined by the enumerator. While differences in the definition of urban and rural areas, informal and formal areas, or commercial and ex-homelands may exist between the IES/LFS 2000 and the TUS 2000, this is an error that cannot be controlled for (see Figure 3 further down for comparisons across the IES/LFS 2000 and the TUS 2000).

4.3.2.   Population Group

The next major division is a racial split. Given the small number of White, Coloured and Asian households living in informal urban areas (see Table 4), all urban households from these three racial groups are grouped under formal areas. A similar assumption was made for non-African households living in former homelands. This approach is unfortunately unavoidable given small sample sizes of non-Africans in urban informal areas and the former homelands. A further necessary step was to group Coloured and Asian households together, following previous versions of the PROVIDE SAM. Of the four racial groups, these two racial groups on average have the most similarities, although generally speaking the Asian population is slightly better off in terms of income and education levels. While the ideal would have been to keep these separate, the prevalence of Asian households in rural and informal urban areas is too low to justify having a separate account for these households. Asian households are located mostly in Gauteng and KwaZulu-Natal, while Coloured households are predominantly found in the Western, Northern and Eastern Cape provinces.

Table 4: Distribution of Households across Location and Race (Per centages)

	African	Coloured	Asian	White	Total
Row shares					
Urban formal	63.2	12.1	4.4	20.2	*100.0*
Urban informal	94.5	4.7	0.6	0.1	*100.0*
Rural commercial	85.6	9.1	0.4	4.9	*100.0*
Rural ex-homeland	99.6	0.2	0.0	0.1	*100.0*
TOTAL	*78.3*	*8.1*	*2.4*	*11.2*	*100.0*
Column shares					
Urban formal	41.9	77.4	94.7	93.5	51.8
Urban informal	13.3	6.4	2.7	0.1	11.0
Rural commercial	15.2	15.6	2.3	6.1	13.9
Rural ex-homeland	29.6	0.5	0.3	0.3	23.3
TOTAL	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Source: IES/LFS 2000

Despite the fact that the *hhstrata* variable had to be constructed from raw data in the IES/LFS 2000, a comparison of the distribution of households across location and race between the IES/LFS 2000 and TUS 2000 reveals a fairly close match. Figure 3 looks at the racial allocation within regions as well as the distribution of households from different race groups across the four types of locations found in the IES/LFS 2000 and the TUS 2000. The two datasets produce fairly consistent shares, although some obvious differences appear in the racial composition in rural commercial areas (left-hand panel) and, to some extent, the distribution of Africans across locations (right-hand panel).[7]

Figure 3: Comparing IES/LFS 2000 and TUS 2000 Household Allocations
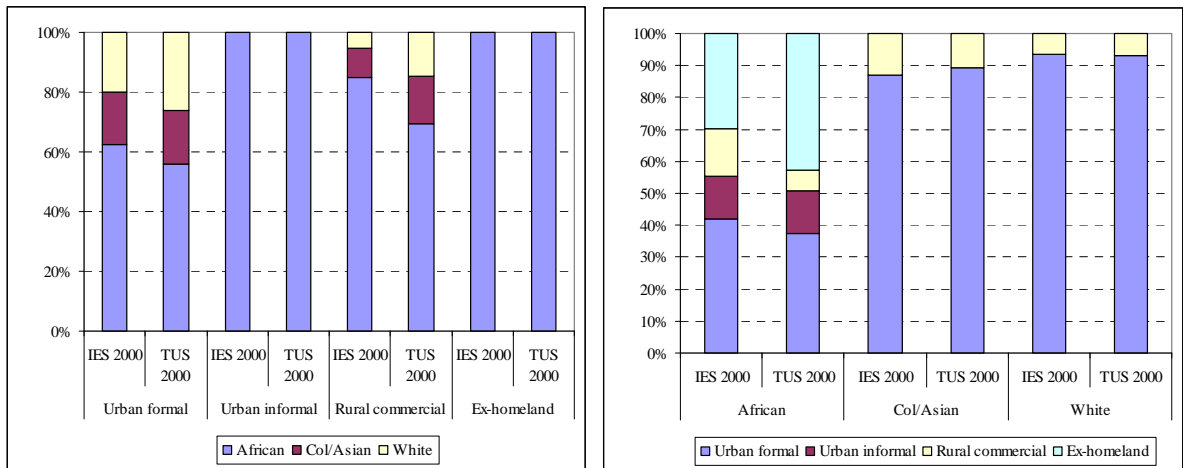
Source: IES/LFS 2000 and TUS 2000

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7   Weighted figures are used in both figures. The IES/LFS 2000 weights adjust the sample to match the racial and geographical (province and urban/rural) distribution of the South African population using the National Census of 1996 as benchmark. The weighted figures also reproduce the estimated total population size of South Africa in 2000 (about 42.6 million). The TUS 2000 weights also correct for racial and geographical shares (the same four strata used in our household group formation) using the National Census of 1996, but the population is not weighted up to national figures. Hence only shares can be compared.

4.3.3.   Gender of the Household Head

Given the large share of households classified as African (see Table 4), it is possible to disaggregate African households further into male- and female headed households. Much research has been conducted, internationally, on the issue of how male- and female-headed households differ in terms of expenditure profiles and major income sources. In South Africa the distinction between male and female-headed households is important, especially for African households. Firstly, about 42 per cent of African households are headed by females, which is in stark contrast with Coloured (33 per cent) and Asian and White households (both 21 per cent).

Secondly, many African males are employed as migrant workers on mines, which means that females are left behind to head households. Many of these female-headed households still live in the former homeland areas, with 55 per cent of households in ex-homelands headed by females. This also means that income from remittances or transfers is an important source of household income for many African female-headed households, especially for those in the former homelands. There is also evidence in the literature that female-headed households spend relatively more on social goods such as health and education (see for example Duflo, 2003, which looks at female 'recipiency' of social pensions and the impact on the family health status). Differences in income sources and expenditure patterns of female and male-headed households are explored further below.[8]

Table 5 shows some estimates of average expenditure shares for female- and male-headed households of different racial groups as reported in the IES/LFS 2000. While statistical testing falls beyond the scope of this technical report, it can generally be confirmed that relative expenditure on food and health and education is higher for female-headed households, with these differences being slightly more pronounced in lower income households. Male-headed households, in contrast, spend more on beverages and tobacco.

Table 6 shows the income shares of male- and female-headed households. Income categories in this table include wage income, income from gross operating surplus (returns to physical and human capital employed in production and owned by the household), dividends and other investment income, government welfare (pensions, disability grants and family grants, which mainly includes child welfare grants) and remittance income. Wage income is a much more important income source in male-headed households (which also explains the higher income tax share, see Table 5). These differences are again slightly more pronounced

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8   For the aggregated IO SAM the gender split is removed in order to reduce the number of household
     accounts.

at lower income levels. Poor female-headed households in particular rely more on government welfare transfers and remittance income than their male counterparts.[9]

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[9] Note these shares are derived directly from the IES/LFS 2000 dataset. During the SAM balancing process some of these shares may become slightly distorted.

Table 5: Expenditure Shares by Race and Gender of the Head of the Household

		Ultra poor		Poor		Lower middle income		Upper middle income		High income	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
African	Food	54.0%	56.3%	46.5%	49.5%	37.3%	39.2%	23.6%	26.3%	12.0%	15.7%
	Beverages & tobacco	4.2%	1.6%	5.2%	2.3%	5.7%	2.6%	4.8%	2.1%	3.4%	1.6%
	Textiles	3.9%	4.3%	4.6%	5.0%	4.7%	5.0%	4.9%	4.9%	3.8%	4.1%
	Manufacturing	20.8%	20.6%	19.4%	19.7%	18.2%	17.7%	16.5%	15.9%	14.7%	18.1%
	Health & education	3.1%	3.4%	2.6%	2.8%	2.8%	3.2%	3.9%	6.0%	4.6%	6.7%
	Other services	12.5%	12.5%	17.3%	16.9%	21.4%	22.5%	23.8%	25.7%	23.1%	26.9%
	Income tax	0.6%	0.5%	1.9%	1.5%	3.4%	2.8%	5.9%	4.5%	8.8%	9.7%
	Remittances	0.6%	0.5%	1.6%	1.3%	4.4%	5.2%	12.0%	10.0%	21.7%	9.0%
	Savings	0.3%	0.4%	1.0%	0.9%	2.2%	1.7%	4.7%	4.6%	7.9%	8.3%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Col/Asian	Food	54.0%	48.8%	48.5%	49.1%	38.7%	39.6%	23.8%	27.3%	13.1%	15.7%
	Beverages & tobacco	4.7%	3.4%	6.4%	4.1%	6.5%	4.5%	3.8%	3.2%	2.5%	2.6%
	Textiles	2.8%	2.6%	3.7%	2.7%	3.7%	4.4%	3.4%	4.0%	2.5%	3.7%
	Manufacturing	14.7%	17.7%	15.0%	14.0%	14.5%	14.8%	16.7%	14.0%	16.5%	13.5%
	Health & education	1.7%	2.2%	2.2%	3.0%	3.0%	2.8%	5.2%	4.5%	7.1%	6.7%
	Other services	20.5%	23.6%	20.4%	23.5%	24.4%	26.2%	29.2%	31.3%	30.2%	34.4%
	Income tax	1.3%	1.4%	2.6%	2.5%	5.2%	4.8%	8.7%	6.7%	13.7%	13.0%
	Remittances	0.3%	0.0%	0.3%	0.7%	1.2%	0.8%	1.4%	2.3%	2.0%	2.4%
	Savings	0.1%	0.2%	1.1%	0.4%	2.9%	2.3%	7.8%	6.7%	12.4%	8.0%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
White	Food					31.9%	36.5%	20.3%	22.1%	11.5%	12.8%
	Beverages & tobacco					3.6%	1.5%	3.2%	2.8%	2.0%	2.0%
	Textiles					1.8%	1.3%	2.3%	2.5%	1.9%	2.0%
	Manufacturing					12.7%	12.5%	16.3%	14.6%	16.8%	16.1%
	Health & education					5.1%	3.8%	7.8%	4.7%	7.9%	7.3%
	Other services					34.3%	37.1%	33.4%	41.2%	33.6%	37.1%
	Income tax					6.1%	5.2%	10.1%	7.7%	14.3%	12.6%
	Remittances					0.7%	0.3%	0.4%	1.0%	1.3%	1.3%
	Savings					4.0%	1.8%	6.2%	3.3%	10.7%	8.8%
	Total					100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: IES/LFS 2000

Table 6: Income Shares by Race and Gender of the Head of the Household

		Ultra poor		Poor		Lower middle income		Upper middle income		High income	
		Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
African	Wage income	42.1%	26.7%	56.6%	35.6%	73.2%	56.6%	86.6%	74.5%	89.7%	83.3%
	Income from GOS	3.3%	2.5%	3.8%	3.6%	3.9%	5.2%	4.1%	4.6%	3.4%	3.6%
	Dividends and investments	1.9%	1.2%	1.8%	1.6%	1.7%	2.4%	2.1%	1.8%	2.4%	3.8%
	Government welfare	28.0%	34.3%	23.0%	32.0%	12.5%	19.2%	3.9%	7.9%	2.4%	3.6%
	Remittances	24.8%	35.4%	14.9%	27.2%	8.8%	16.6%	3.4%	11.2%	2.3%	5.6%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Col/Asian	Wage income	50.1%	36.6%	68.1%	45.0%	75.9%	58.3%	86.1%	71.8%	89.0%	85.1%
	Income from GOS	1.5%	4.1%	0.5%	2.2%	2.2%	2.0%	3.7%	1.8%	2.9%	1.4%
	Dividends and investments	4.8%	0.3%	0.9%	2.8%	1.7%	2.0%	4.5%	5.0%	4.5%	5.0%
	Government welfare	30.3%	39.9%	24.3%	33.3%	16.5%	26.6%	4.0%	14.1%	2.4%	2.3%
	Remittances	13.4%	19.2%	6.2%	16.7%	3.7%	11.1%	1.7%	7.2%	1.2%	6.3%
	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
White	Wage income					61.2%	25.2%	67.5%	44.0%	78.4%	63.8%
	Income from GOS					2.1%	2.4%	1.4%	0.7%	4.1%	2.9%
	Dividends and investments					12.9%	18.3%	17.2%	16.2%	13.1%	21.1%
	Government welfare					20.8%	41.1%	9.9%	22.9%	3.1%	6.9%
	Remittances					2.9%	13.1%	4.0%	16.3%	1.3%	5.3%
	Total					100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: IES/LFS 2000

4.3.4.   *Income Groups*

Next, households are grouped into five household income categories. A per capita income variable, representing 'welfare' in it simplest monetary form, is constructed for each household by dividing the total household income by the household size. The same per capita income is allocated to each household member, irrespective of the member's age, labour market status or income sources. This uniform distribution of income within the household implies perfect sharing of income within the household.[10] Households are then grouped around the 25th, 50th, 75th and 90th per centiles of per capita income. The five resulting groups are labelled ultra poor, poor, lower middle income, upper middle income and high income.

By construction no White households are poor or ultra poor. The few White people that fall below the ultra poverty line (about 0.2 per cent) or between the two poverty lines (a further 0.8 per cent) do not justify putting them in a separate group. Consequently all poor and ultra poor Whites are grouped together with the lower middle income group. Some summary statistics on population size, number of households and per capita income distribution is provided in Table 7 below, while Table 8 shows the distribution of the population (not households) across the income groups.

Table 7: Household Income Groups

	Per centile descriptions	Number of households	Number of individuals	Min p.c. income	Max p.c. income	Average p.c. income
Ultra poor	0-25th ptile	1,721,143	10,663,133	~	1,846	1,160
Poor	25-50th ptile	2,232,265	10,695,349	1,847	4,000	2,784
Low-mid inc	50-75th ptile	2,951,987	10,620,828	4,001	10,593	6,502
Upp-mid inc	75-90th ptile	2,249,017	6,397,612	10,597	29,251	17,616
High income	90th ptile +	1,819,524	4,262,593	29,253	~	70,506
Total		10,973,935	42,639,514	~	~	12,412

Source: IES/LFS 2000

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[10]   Very little information is available on intra-household income distributions in South Africa. Hence, most researchers assume a uniform distribution.

Table 8: Distribution of the Population across Income Groups and Race (Per centages)

	African	Coloured	Asian	White	Total
Row shares					
Ultra poor	96.8	3.0	0.1	0.1	*100.0*
Poor	91.6	7.7	0.4	0.3	*100.0*
Low-mid inc	79.6	14.7	3.4	2.3	*100.0*
Upp-mid inc	61.0	15.3	7.0	16.8	*100.0*
High income	28.8	8.4	5.7	57.1	*100.0*
Total	*79.2*	*9.3*	*2.5*	*9.0*	*100.0*
Column shares					
Ultra poor	32.0	8.4	1.1	0.2	*26.2*
Poor	29.2	20.8	4.3	0.8	*25.2*
Low-mid inc	24.0	37.8	31.9	6.0	*23.9*
Upp-mid inc	11.1	23.6	39.3	27.0	*14.4*
High income	3.8	9.4	23.5	66.1	*10.4*
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Source: IES/LFS 2000

As shown in Table 7 each of the bottom three quartiles contains roughly 10.6 million individuals, while the two richest groups combined also have about 10.6 million individuals. The distribution of households is, however, biased towards the upper income groups. This is evidence of the fact that poorer households are generally larger in size. As far as income distribution is concerned we firstly note that 25 per cent of people live on an annual per capita income of around R1 846. These individuals are labelled 'ultra poor', and hence R1 846 can be regarded as a relative 'ultra poverty line'. A further 25 per cent of the population live on between R1 847 and R4 000 per annum and are labelled 'poor'. The implied poverty line of R4 000 is in the same vicinity as many other poverty lines that have been used for South African poverty analyses.[11] The average per capita income level within these household groups roughly doubles from ultra poor to poor households, and from poor to lower middle income households. However, from lower middle to upper middle income households the income level almost triples, and thereafter increases fourfold as we move to the high income group. This skewed distribution of income attests to the immense inequalities in living standards in South Africa.

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[11]   For example, Hoogeveen and Özler (2004) suggest that a reasonable poverty line is in the region of R3 841 per capita per annum (also in 2000 prices). Incidentally, these authors chose their ultra poverty line as R2 088 per capita per annum.

4.3.5.   *Summary Statistics for SAM Household Groups*

Table 9 provides population estimates and information on labour market status of members of the various household groups. Table 10 presents detailed information on welfare grant recipiency of households.

Table 9: Population and Labour Market Participation (Number of individuals)

	Labour Market Participants (Expanded Definition)				Not Economically Active							Total population
	Male employed	Female employed	Male unem-ployed	Female unem-ployed	Children u/15	Male adults in fulltime education	Female adults in fulltime education	Other male adults not econ active	Other female adults not econ active	Male pensioners (age > 65)	Female pensioners (age > 60)	
Urb formal African Ultra poor M	39,861	37,560	116,259	109,640	274,380	52,300	45,479	34,572	32,819	16,169	11,726	770,765
Urb formal African Ultra poor F	18,806	68,102	136,213	193,638	444,562	76,706	94,171	36,579	59,748	1,071	62,429	1,192,026
Urb formal African Poor M	173,948	100,695	183,610	185,905	505,737	92,662	110,653	61,722	68,378	53,157	30,352	1,566,820
Urb formal African Poor F	59,207	199,320	178,149	241,087	593,684	109,416	131,051	31,743	90,425	3,129	103,640	1,740,852
Urb formal African Lwr mid inc M	546,073	251,802	250,249	260,873	729,726	151,007	140,198	75,649	102,702	45,705	30,096	2,584,080
Urb formal African Lwr mid inc F	104,648	359,040	125,820	188,459	429,694	90,944	118,691	21,851	62,176	4,757	102,643	1,608,723
Urb formal African Upp mid inc M	677,783	232,699	113,689	165,571	434,438	111,815	82,142	34,735	53,036	12,238	13,651	1,931,797
Urb formal African Upp mid inc F	55,546	313,380	33,886	54,412	182,249	51,676	65,983	13,541	21,857	0	28,095	820,626
Urb formal African High inc M	426,546	118,814	18,335	29,357	132,346	27,422	30,359	10,184	14,970	5,024	2,815	816,172
Urb formal African High inc F	22,544	107,212	5,115	12,255	42,798	14,052	10,331	1,517	5,211	833	1,939	223,807
Urb formal Col_Asi Ultra poor	13,623	12,965	22,510	32,469	94,646	7,463	7,213	9,276	20,934	1,242	3,327	225,668
Urb formal Col_Asi Poor	43,164	46,267	50,993	65,647	211,849	25,770	20,431	33,663	51,248	7,482	18,757	575,270
Urb formal Col_Asi Lwr mid inc	222,589	188,936	92,804	117,137	465,667	54,825	53,730	63,784	149,750	27,491	69,291	1,506,006
Urb formal Col_Asi Upp mid inc	306,058	226,624	38,803	56,672	325,253	47,385	57,672	32,663	98,559	13,538	53,102	1,256,330
Urb formal Col_Asi High inc	175,408	148,905	11,890	11,793	122,300	30,088	24,198	11,169	33,169	6,023	14,560	589,503
Urb formal White Lwr mid inc	25,083	11,965	11,149	17,077	52,255	7,665	7,447	12,704	27,256	8,051	17,022	197,673
Urb formal White Upp mid inc	156,133	139,711	22,449	33,380	223,469	42,892	26,894	43,645	74,373	47,974	84,927	895,847
Urb formal White High inc	632,404	513,073	16,124	34,734	366,238	106,847	94,255	55,614	132,493	64,479	111,438	2,127,700
Urb informal African Ultra poor M	34,584	20,263	64,563	61,201	135,493	20,927	23,822	16,382	12,453	2,264	3,171	395,124
Urb informal African Ultra poor F	6,105	50,265	26,140	55,358	170,230	36,441	29,748	4,356	20,403	662	7,661	407,368
Urb informal African Poor M	119,060	52,244	96,726	103,698	255,103	43,050	25,614	19,487	35,324	11,195	6,350	767,853
Urb informal African Poor F	16,619	84,606	28,762	66,487	174,035	23,930	32,579	4,969	20,929	394	15,886	469,197
Urb informal African Lwr mid inc M	257,175	91,398	73,631	126,396	262,828	37,318	29,082	12,289	34,731	10,182	7,825	942,855
Urb informal African Lwr mid inc F	30,309	116,391	22,328	51,367	122,387	16,970	30,625	2,834	14,345	0	22,651	430,206
Urb informal African Upp mid inc M	158,894	31,037	20,149	35,935	34,397	6,510	4,431	2,352	8,613	1,312	0	303,630
Urb informal African Upp mid inc F	7,593	34,632	4,551	8,905	12,896	156	3,597	0	3,033	0	2,401	77,763
Urb informal African High inc M	32,036	5,070	680	872	680	1,387	0	681	680	0	0	42,086
Urb informal African High inc F	124	6,077	0	0	0	1,317	0	0	0	0	0	7,518

Table 9 continued…

	Labour Market Participants (Expanded Definition)				Not Economically Active							Total population
	Male employed	Female employed	Male unem-ployed	Female unem-ployed	Children u/15	Male adults in fulltime education	Female adults in fulltime education	Other male adults not econ active	Other female adults not econ active	Male pensioners (age > 65)	Female pensioners (age > 60)	
Rur comm African Ultra poor M	83,747	46,897	64,037	88,184	367,756	51,714	50,249	36,189	56,737	11,406	13,031	869,948
Rur comm African Ultra poor F	18,069	75,918	66,575	101,208	473,083	65,799	63,659	21,149	68,592	2,305	46,017	1,002,373
Rur comm African Poor M	144,768	75,076	55,695	65,428	290,348	45,457	39,812	29,294	45,500	19,432	14,179	824,989
Rur comm African Poor F	30,639	78,890	30,239	58,914	228,801	35,827	34,146	11,114	38,553	1,877	38,769	587,769
Rur comm African Lwr mid inc M	232,221	78,890	35,848	55,939	185,555	27,933	26,917	10,887	32,696	20,507	14,109	721,501
Rur comm African Lwr mid inc F	19,359	100,344	25,150	34,385	87,583	19,848	20,170	5,829	15,290	125	18,729	346,812
Rur comm African Upp mid inc M	165,184	36,862	11,602	15,851	51,050	7,885	8,346	3,770	5,330	2,660	1,123	309,664
Rur comm African Upp mid inc F	12,232	38,505	9,028	11,296	23,332	4,916	2,488	2,114	4,193	0	1,890	109,993
Rur comm African High inc M	140,757	6,557	1,926	1,630	9,179	1,392	1,365	2,480	1,570	301	0	167,158
Rur comm African High inc F	900	6,202	373	1,318	2,494	599	1,802	0	0	0	876	14,564
Rur comm Col_Asi Ultra poor	6,297	3,551	2,078	5,093	20,762	1,206	808	1,278	5,444	717	588	47,821
Rur comm Col_Asi Poor	37,265	25,669	6,502	11,050	69,241	4,405	3,347	3,812	18,492	5,137	5,626	190,545
Rur comm Col_Asi Lwr mid inc	73,810	50,791	10,168	10,116	75,762	8,394	8,359	4,576	20,612	5,641	9,183	277,412
Rur comm Col_Asi Upp mid inc	21,700	12,523	3,353	4,207	15,975	1,407	1,991	1,231	6,034	588	1,333	70,342
Rur comm Col_Asi High inc	1,859	541	0	0	0	0	0	104	328	0	125	2,957
Rur comm White Lwr mid inc	7,705	1,976	500	1,101	4,385	949	909	929	2,120	1,030	1,236	22,840
Rur comm White Upp mid inc	14,106	5,914	750	1,471	13,955	1,333	1,226	1,507	6,659	2,558	3,638	53,117
Rur comm White High inc	51,124	30,498	1,894	1,757	22,831	5,341	3,537	2,709	15,641	2,395	6,334	144,062
Ex-hland African Ultra poor M	164,499	116,791	177,586	165,495	905,229	144,831	135,176	86,891	123,986	51,543	33,100	2,105,127
Ex-hland African Ultra poor F	85,652	290,479	189,832	318,070	1,803,188	240,329	276,642	58,459	223,361	628	157,704	3,644,344
Ex-hland African Poor M	215,872	134,465	117,459	106,739	659,976	139,943	134,400	67,206	103,401	71,787	53,989	1,805,237
Ex-hland African Poor F	78,109	249,071	98,158	159,647	879,486	162,391	185,378	42,078	123,164	4,424	165,155	2,147,061
Ex-hland African Lwr mid inc M	237,671	100,125	73,533	70,911	349,947	79,593	62,466	41,381	60,505	51,109	37,850	1,165,091
Ex-hland African Lwr mid inc F	43,926	154,812	32,486	60,390	282,226	58,574	68,974	15,630	35,089	3,450	84,397	839,955
Ex-hland African Upp mid inc M	112,894	49,480	21,860	20,656	112,353	24,169	24,774	9,439	14,375	5,011	5,998	401,009
Ex-hland African Upp mid inc F	10,179	53,429	4,999	7,234	55,458	9,999	13,061	355	3,576	281	8,922	167,493
Ex-hland African High inc M	32,767	14,785	2,892	721	20,522	4,814	5,129	1,156	1,975	1,134	281	86,177
Ex-hland African High inc F	859	23,060	1,244	698	7,744	2,879	1,459	0	675	0	2,272	40,890
Total for South Africa	6,406,093	5,431,154	2,811,344	3,699,834	13,817,561	2,440,868	2,476,986	1,109,528	2,283,513	610,418	1,552,209	42,639,516

Source: IES/LFS 2000

Table 10: **Households and Welfare Recipiency**

	Number of Households Receiving Different Types/Combinations of Grants									Welfare Income as Shares of Total Income			
	Total no. of hholds	Hholds with no welfare inc	Hholds with pension only	Hholds with disability only	Hholds with family grant only	Hholds with pension & disability	Hholds with ension & family	Hholds with disability & family	Hholds receiving all three grants	Pensions	Disability grants	Family grants	Total welfare income
Urb formal African Ultra poor M	126,174	93,055	19,619	5,963	4,896	1,934	707			19.0%	5.0%	1.1%	25.1%
Urb formal African Ultra poor F	177,719	96,650	51,822	4,008	16,585	1,856	5,244	1,554		28.4%	3.7%	3.6%	35.7%
Urb formal African Poor M	304,668	214,857	53,804	18,626	9,849	4,310	2,320	396	506	12.9%	4.3%	0.7%	18.0%
Urb formal African Poor F	331,697	184,578	100,825	11,512	16,884	8,234	6,069	3,108	488	17.1%	3.8%	1.6%	22.5%
Urb formal African Lwr mid inc M	651,839	557,276	63,941	15,117	12,129	2,003	1,374			3.5%	0.8%	0.3%	4.5%
Urb formal African Lwr mid inc F	456,286	319,218	96,903	13,242	13,055	6,246	7,062	315	245	8.4%	1.5%	1.1%	11.0%
Urb formal African Upp mid inc M	683,755	650,757	18,788	7,060	5,991	1,159				0.8%	0.4%	0.2%	1.5%
Urb formal African Upp mid inc F	337,777	293,971	30,402	3,346	6,605	2,651		802		2.2%	0.5%	0.4%	3.1%
Urb formal African High inc M	421,772	415,300	5,167	530	250	525				0.5%	0.1%	0.0%	0.6%
Urb formal African High inc F	103,475	97,235	5,289	837	115					0.4%	0.1%	0.0%	0.5%
Urb formal Col_Asi Ultra poor	39,931	23,854	4,254	3,979	5,830	614	430	970		12.2%	13.4%	7.1%	32.7%
Urb formal Col_Asi Poor	101,738	55,211	19,388	12,254	5,192	3,409	1,911	3,971	402	12.0%	9.3%	2.9%	24.2%
Urb formal Col_Asi Lwr mid inc	340,969	203,950	72,456	31,564	14,155	8,550	5,531	4,459	303	7.5%	3.4%	1.0%	12.0%
Urb formal Col_Asi Upp mid inc	338,490	267,675	48,103	10,589	7,813	3,504	608	197		2.0%	0.5%	0.4%	2.8%
Urb formal Col_Asi High inc	186,737	172,137	11,330	2,040	1,001		229			0.8%	0.0%	0.1%	0.9%
Urb formal White Lwr mid inc	53,027	38,335	10,417	1,273	1,023	1,188	790			7.4%	1.5%	1.3%	10.2%
Urb formal White Upp mid inc	289,004	216,177	57,463	11,872	2,221	1,058	214			5.5%	1.1%	0.3%	6.9%
Urb formal White High inc	807,836	748,579	41,815	5,420	10,176	1,846				0.9%	0.1%	0.2%	1.2%
Urb informal African Ultra poor M	80,006	70,482	4,335	1,788	2,699	701				7.3%	4.3%	0.6%	12.1%
Urb informal African Ultra poor F	80,859	59,421	6,523	2,637	11,704		574			9.5%	2.1%	6.8%	18.5%
Urb informal African Poor M	188,627	165,448	13,707	5,124	3,100	501	747			5.2%	1.6%	0.5%	7.3%
Urb informal African Poor F	119,873	95,399	16,094	2,087	5,912		382			9.1%	1.2%	1.6%	11.8%
Urb informal African Lwr mid inc M	292,531	262,378	16,438	5,561	8,073	81				2.3%	0.7%	0.4%	3.5%
Urb informal African Lwr mid inc F	147,269	120,156	20,748	1,955	3,995	124	290			6.0%	0.5%	0.2%	6.7%
Urb informal African Upp mid inc M	156,474	152,179	1,852	1,432	1,011					0.3%	0.2%	0.2%	0.6%
Urb informal African Upp mid inc F	39,418	35,592	3,266	299	261					1.8%	0.2%	0.0%	2.0%
Urb informal African High inc M	32,582	31,470	1,112							0.2%	0.0%	0.0%	0.2%
Urb informal African High inc F	5,953	5,953								0.0%	0.0%	0.0%	0.0%

Table 10 continued…

	Number of Households Receiving Different Types/Combinations of Grants									Welfare Income as Shares of Total Income			
	Total no. of hholds	Hholds with no welfare inc	Hholds with pension only	Hholds with disability only	Hholds with family grant only	Hholds with pension & disability	Hholds with ension & family	Hholds with disability & family	Hholds receiving all three grants	Pensions	Disability grants	Family grants	Total welfare income
Rur comm African Ultra poor M	131,849	97,277	22,117	5,356	3,082	1,991	1,357	668		19.9%	4.9%	1.2%	26.1%
Rur comm African Ultra poor F	150,725	91,695	40,470	6,321	7,179	3,134	1,562		364	25.6%	4.4%	1.7%	31.7%
Rur comm African Poor M	173,572	140,405	25,619	5,108	749	1,396	294			11.7%	1.8%	0.1%	13.7%
Rur comm African Poor F	131,201	84,640	36,550	3,536	3,181	2,523	423	349		19.3%	2.6%	1.2%	23.1%
Rur comm African Lwr mid inc M	246,629	214,444	24,065	4,584	969	1,964	372		232	5.3%	0.9%	0.2%	6.4%
Rur comm African Lwr mid inc F	122,839	95,049	22,858	1,739	610	2,583				9.1%	1.4%	0.2%	10.8%
Rur comm African Upp mid inc M	160,449	155,328	4,075	696	351					0.8%	0.1%	0.0%	0.8%
Rur comm African Upp mid inc F	38,453	34,795	1,898	767	993					0.8%	0.3%	0.6%	1.7%
Rur comm African High inc M	141,211	139,986	301	923						0.1%	1.1%	0.0%	1.2%
Rur comm African High inc F	7,136	6,260	589			287				0.7%	0.2%	0.0%	0.9%
Rur comm Col_Asi Ultra poor	8,783	6,576	96	886	437		549	240		6.1%	11.0%	2.5%	19.6%
Rur comm Col_Asi Poor	41,620	28,861	6,713	2,452	1,588	517	900	590		13.0%	4.3%	1.8%	19.1%
Rur comm Col_Asi Lwr mid inc	75,791	56,831	11,353	2,921	2,863	694	338	790		6.6%	1.9%	1.1%	9.6%
Rur comm Col_Asi Upp mid inc	22,258	18,931	2,263	758	137			169		1.9%	0.5%	0.3%	2.7%
Rur comm Col_Asi High inc	2,190	1,960	125	104						0.3%	2.8%	0.0%	3.1%
Rur comm White Lwr mid inc	7,699	5,418	2,055	227						13.1%	0.8%	0.0%	13.8%
Rur comm White Upp mid inc	17,027	15,067	1,707	58	195					4.1%	0.3%	0.1%	4.6%
Rur comm White High inc	53,882	48,718	4,596	373	195					0.4%	0.1%	0.0%	0.5%
Ex-hland African Ultra poor M	334,089	229,901	71,918	12,701	12,961	609	4,222	1,300	477	25.7%	4.3%	1.3%	31.2%
Ex-hland African Ultra poor F	590,224	378,395	156,929	7,810	30,667	4,520	8,883	2,591	430	27.2%	2.3%	2.3%	31.8%
Ex-hland African Poor M	353,011	210,514	110,142	14,249	8,134	4,784	3,931	401	855	23.9%	2.6%	0.4%	26.9%
Ex-hland African Poor F	482,848	254,129	182,268	10,573	15,546	12,978	4,287	1,780	1,287	25.0%	3.1%	1.0%	29.1%
Ex-hland African Lwr mid inc M	317,380	216,780	82,531	9,351	4,230	3,296	1,048		145	11.3%	1.1%	0.2%	12.7%
Ex-hland African Lwr mid inc F	243,919	137,138	86,798	4,586	5,880	3,749	5,769			14.5%	1.1%	1.0%	16.6%
Ex-hland African Upp mid inc M	113,051	99,006	7,643	2,528	3,355	281	239			1.3%	0.3%	0.1%	1.7%
Ex-hland African Upp mid inc F	52,862	40,774	10,808			957	323			5.5%	0.2%	0.0%	5.8%
Ex-hland African High inc M	33,571	32,002	1,570							0.3%	0.0%	0.0%	0.3%
Ex-hland African High inc F	23,178	20,906	2,272							1.4%	0.0%	0.0%	1.4%
Total for South Africa	10,973,933	8,509,079	1,716,190	278,722	273,827	96,757	68,979	24,650	5,734				

Source: IES/LFS 2000

4.3.6. *Estimating Income Elasticities for Household Groups*

The structural path analysis model for which the input-output SAM is used requires additional information in the form of income elasticities of demand, the method of calculation which is discussed here. The income elasticity of demand for a consumer is defined as the per centage change in consumption expenditure in response to a 1 per cent change in his or her income. Generally such elasticities are less than one given that consumers save a portion of their income. Non-consumption expenditure such as remittance payments, taxes, etc., also reduces the amount of disposable income available for allocation to pure goods and services. Typically the average rate of non-consumption expenditure, especially savings and taxes, increases as income goes up.

Formally, the income elasticity of demand of a household (η_h) is defined as

$$\eta_h = \frac{d \ln C_h}{d \ln Y_h} = \frac{\partial C_h / C_h}{\partial Y_h / Y_h} = \frac{\partial C_h / \partial Y_h}{C_h / Y_h} \qquad [1]$$

where C_h is the household's consumption expenditure level and Y_h is the household income. The elasticity can be estimated using a simple econometric model of the form

$$\log C_i = \beta_1 + \beta_2 \log Y_i + \varepsilon_i . \qquad [2]$$

When using the double-log or log-linear functional form in this manner the estimated coefficient $\hat{\beta}_2$ is equal to the income elasticity η. Income elasticities were estimated for eight aggregated household groups in the SAM. While an alternative approach would have been to estimate elasticities for each representative household group in the SAM, this was decided against as the estimation would then be based on truncated income distributions, thus not fully capturing the relationship between income and expenditure across the spectrum of incomes.

The estimated coefficients as well as some average household expenditure shares (from the IES/LFS 2000) are shown in Table 11. Note that the first column of the expenditure shares (consumption) reflects the average share C_h/Y_h. Although elasticities do not vary greatly between these population subgroups, a few interesting points can be highlighted. Rural commercial African households have a fairly low elasticity. This is due to the high share of total expenditure that is made up of remittances from these households to other households.[12] Urban formal households as well as rural commercial White households have

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12   Many of the households in this sub-group are mining workers who remit fairly large shares of their income, often back to family members in former homelands. As shown in the table the presumed recipients have a fairly high elasticity.

fairly high income tax rates, which is indicative of the fact these are typically the households that are involved in formal work activities. These same households also generally have fairly high savings rates, especially so among White households. This puts downward pressure on the consumption elasticity.

Table 11: **Model Coefficient and Average Expenditure Shares by Household Groups**

	Model Coefficient (*)	Expenditure Shares				
		Consumption (all goods & services)	Income & other household taxes	Remittances	Savings	Total
Urban formal African	0.901	77.0	9.5	5.8	7.7	100.0
Urban formal Coloured/Asian	0.898	77.8	11.2	1.5	9.5	100.0
Urban formal White	0.876	69.6	16.1	1.7	12.5	100.0
Urban informal African	0.899	85.8	3.9	7.4	2.9	100.0
Rural commercial African	0.828	76.0	4.8	15.5	3.7	100.0
Rural commercial Coloured/Asian	0.944	90.7	5.0	1.7	2.6	100.0
Rural commercial White	0.910	72.1	12.8	0.8	14.3	100.0
Rural ex-homeland African	0.929	88.2	4.4	4.1	3.3	100.0

Note (*): All estimated coefficients were statistically significant at a 1 per cent level.

Source: Authors calculations, IES/LFS 2000

The average expenditure propensity of households (AEP_h) is defined simply as C_h/Y_h. These values can be read off the SAM to get a more disaggregated picture. Next the marginal expenditure propensity (MEP_h) can be calculated as

$$MEP_h = AEP_h \times \eta_h \qquad [3]$$

4.4. Factor Groups

4.4.1. Province or Region

The labour factors in the SAM are split according to province of residence, gender and education level. The nine provinces in South Africa include the Western Cape, Eastern Cape, Northern Cape, Free State, KwaZulu-Natal, North West, Gauteng, Mpumalanga and Limpopo. Labour market participation varies quite substantially across the regions (see Table 12).[13] The share of people that are in employment in the Western Cape and Gauteng provinces is relatively high. This is evidence of the superior employment prospects in these provinces and is reflected in relatively high income levels in these provinces. Interestingly though, the share of people in Gauteng that are unemployed is the highest in the country, most likely due to the fact that many rural inhabitants migrate to this province in search of employment opportunities.

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13   For the Levy SAM factors are aggregated into four regional areas rather than nine provinces in an effort to reduce the number of accounts. In particular, the Northern and Western Cape form the West Coast region, the Eastern Cape and KwaZulu-Natal form the East Coast region, the Free State, North West and Gauteng form the Central region and Mpumalanga and Limpopo form the Border region.

From Table 12 it is clear that provinces such as the Eastern Cape, North West and Limpopo have fairly high shares of people that are not economically active. However, when compared to Table 13, which shows similar estimates using the expanded definition of unemployment (see note below Table 12), we note that the expanded unemployment rate is almost double the strict unemployment rate in these provinces. This suggests that large shares of people in some provinces in South Africa have become disillusioned about finding employment and hence have given up searching for jobs. Given differences in participation rates across provinces, a provincial split in the factor accounts is important.

Table 12:   Labour Market Participation by Province (Row Per centages) (Strict Definition)

	Not economically active	Employed	Unemployed	Not working age	Total
Western Cape	25.3	36.7	7.7	30.3	100.0
Eastern Cape	32.8	21.0	7.7	38.5	100.0
Northern Cape	30.0	29.8	8.4	31.9	100.0
Free State	28.3	29.0	10.6	32.1	100.0
KwaZulu-Natal	28.7	25.8	9.7	35.7	100.0
North West	32.0	23.7	9.7	34.5	100.0
Gauteng	23.6	36.0	12.3	28.1	100.0
Mpumalanga	26.7	25.9	9.8	37.6	100.0
Limpopo	34.2	16.7	6.9	42.2	100.0
Total	**29.0**	**26.8**	**9.4**	**34.9**	**100.0**

Note: The strict (official) definition as opposed to the expanded definition of unemployment is used in this table. Under the strict definition only active jobseekers are included as unemployed, while inactive jobseekers are regarded as not economically active.

Table 13:   Labour Market Participation by Province (Row Per centages) (Expanded Definition)

	Not economically active	Employed	Unemployed	Not working age	Total
Western Cape	22.2	36.7	10.9	30.3	100.0
Eastern Cape	26.1	21.0	14.4	38.5	100.0
Northern Cape	25.2	29.8	13.1	31.9	100.0
Free State	22.7	29.0	16.1	32.1	100.0
KwaZulu-Natal	23.2	25.8	15.2	35.7	100.0
North West	24.5	23.7	17.2	34.5	100.0
Gauteng	18.8	36.0	17.1	28.1	100.0
Mpumalanga	21.9	25.9	14.6	37.6	100.0
Limpopo	26.9	16.7	14.2	42.2	100.0
Total	23.3	26.8	15.0	34.9	100.0

Source: IES/LFS 2000

4.4.2.   Gender

The gender dimension in the factor account is motivated by a need to analyse gender-issues in more detail, as well as by a well-established literature that presents evidence of discrimination against female workers, as well as differences in labour market participation rates, unemployment rates and earnings between men and women. A study by Van der Westerhuizen et al. (2007) find that women are increasingly engaging in the South African economy, thanks largely to increased participation, mobility and improved education levels among women. However, women are also overrepresented in low-income, less secure employment opportunities. Despite improvements in female education levels and labour market participation rates in recent years, the unemployment rate among women is still significantly higher than that of similarly educated male workers. Young, poorly educated African women are especially vulnerable and face very poor employment prospects. Furthermore, evidence suggests that women earn less than their male counterparts. Clearly then, as Van der Westerhuizen et al. (2007: 48) conclude, although "*progress has been made in advancing the position of women in the labour market, … important challenges remain*".

4.4.3.   Educational Attainment

The final dimension in the factor accounts is educational attainment of workers. It could be argued that education levels are a better predictor of earnings and employment prospect than occupation categories. In previous versions of the PROVIDE SAM occupation categories were used to form factor groups.[14] However, some of these occupation groups are fairly 'broad' in terms of the types of workers that are included within the groups. Hence this classification led to widely dispersed wage income distributions within the factor groups. For example, the highest skills category, namely legislators, senior officials and managers may include CEOs of large corporations and restaurant or shop managers. Skilled agricultural workers may include farmers (owners or managers of large commercial farms) and farm workers.

Clearly, the variation in income can potentially be high when such occupation categories are used. In this version of the SAM, therefore, the highest educational attainment is used to disaggregate the factor account rather than occupation groups. Respondents select from a list of primary (grades 1 to 7) and high school (grade 8 to 12) qualifications. A grade 10 qualification is ranked on the National Qualifications Framework (NQF) as a General

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14   The main occupation types identified in the LFS 2000 include (1) legislators senior officials and managers, (2) professionals, (3) technicians and associate professionals, (4) clerks, (5) service workers and shop market sales workers, (6) skilled agricultural and fishery workers, (7) craft and related trades workers, (8) plant and machine operators and assemblers, (9) elementary occupations, (10) domestic workers, and (11) a category for unspecified occupations. For simplicity these are often mapped to skills groups, e.g. high-skilled (1 – 2), skilled (3 – 5), semi-skilled (6 – 8), and unskilled (9 – 10).

Education and Training (GET) qualification. At the completion of grade 12 a Matriculation Certificate is issued. Post-matric qualifications range from diplomas, technical qualifications and university degrees, including post-graduate degrees.

Given data limitations (sample size) it was decided to restrict the number of education categories to a maximum of three. Table 14 shows how employed labour market participants are distributed across various qualifications. One of the outcomes of apartheid is a very lowly educated labour market, especially among African and Coloured workers. Based on this evidence it may seem appropriate to have a greater degree of detail at the lower end of the education spectrum, thus aggregating across, say, tertiary and upper secondary to form three education groups.

Table 14:   Educational Attainment of Employed People, by Race (Row Per centages)

	None through primary (up to grade 7)	Lower Secondary (grade 8-10)	Upper secondary (grade 11-12)	Tertiary	Other or unspecified	Total
African	41.9	25.9	28.0	3.0	1.2	100.0
Coloured	31.5	31.8	31.7	3.9	1.1	100.0
Asian	7.0	20.6	59.9	11.6	0.8	100.0
White	0.8	14.1	57.8	26.3	1.1	100.0
Total	32.7	24.5	34.4	7.2	1.1	100.0

However, further investigations revealed that it would in fact be more appropriate to aggregate factors at the lower end of the education spectrum. Firstly, the current education policy in South Africa determines that school attendance is compulsory until the completion of grade 9, with most students acquiring at least grade 10 (GET). Thus, very few new labour market entrants would have a lower education level than GET. Secondly, estimates of labour market participation, employment probabilities (using the Heckman two-step procedure) and earnings equations using South African data (see for example Oosthuizen, 2005, and Van der Westhuizen et al., 2007) show clearly that: (1) the decision to participate only increases significantly once a person has a grade 12 qualification; (2) the employment probability of a labour market participant only increases significantly once a person has a grade 12 qualification; and (3) earnings rise gradually as education levels increase, but also jumps significantly with a matric qualification. This evidence suggests that maintaining a split between primary school and lower secondary school or GET is perhaps unnecessary. In fact, the distinction between grade 12 and the other categories is much more important. Consequently the three selected education categories include 'none through GET', 'matric' and 'tertiary'.

4.4.4.   Summary Statistics for SAM Factor Groups

Table 15 below provides some summary statistics on labour market status (of adults) by factor groups, as well as the distribution of wages.

Table 15:   Number of Workers and Wage Distribution

	Adult labour market status at time of interview				Employed (reported income)	Distribution of wages (Rand, 2000 prices)			
	Not econ active	Unemployed	Employed	Unemp. rate		25th Per centile	Median	75th Per centile	Mean wage
WC Male None to GET	265,952	153,901	479,705	24.3%	514,067	R 9,256	R 15,600	R 26,412	R 23,103
WC Male Matric	46,645	36,958	185,124	16.6%	190,385	R 19,344	R 37,500	R 78,000	R 59,796
WC Male Tertiary	35,063	3,431	137,981	2.4%	138,323	R 56,880	R 102,000	R 162,000	R 133,074
WC Female None to GET	419,700	180,188	390,455	31.6%	419,975	R 6,240	R 11,160	R 21,600	R 15,853
WC Female Matric	78,290	52,506	163,712	24.3%	165,085	R 14,400	R 30,000	R 54,000	R 40,370
WC Female Tertiary	37,525	7,724	106,461	6.8%	104,576	R 38,700	R 65,000	R 96,000	R 77,121
EC Male None to GET	657,000	363,501	535,474	40.4%	405,418	R 3,840	R 8,400	R 18,000	R 13,956
EC Male Matric	38,172	61,566	107,343	36.4%	100,411	R 14,400	R 31,752	R 62,122	R 43,322
EC Male Tertiary	7,973	9,697	65,078	13.0%	61,732	R 48,020	R 84,000	R 130,000	R 101,633
EC Female None to GET	996,774	425,834	520,473	45.0%	364,711	R 2,600	R 5,000	R 9,600	R 9,070
EC Female Matric	65,292	101,361	110,623	47.8%	104,055	R 7,800	R 21,600	R 40,000	R 28,007
EC Female Tertiary	14,596	16,002	94,321	14.5%	87,679	R 33,600	R 53,500	R 72,000	R 57,466
NC Male None to GET	75,170	38,953	109,539	26.2%	112,023	R 5,200	R 9,000	R 21,960	R 22,020
NC Male Matric	4,661	6,718	24,715	21.4%	25,269	R 21,600	R 53,800	R 84,000	R 70,290
NC Male Tertiary	939	489	14,985	3.2%	15,560	R 64,650	R 90,000	R 138,720	R 125,815
NC Female None to GET	124,412	53,381	71,708	42.7%	72,632	R 2,800	R 4,800	R 8,400	R 8,987
NC Female Matric	9,737	11,398	24,107	32.1%	24,039	R 9,600	R 27,600	R 54,000	R 37,325
NC Female Tertiary	3,436	2,670	12,389	17.7%	12,389	R 31,500	R 54,000	R 72,000	R 68,164
FS Male None to GET	224,620	138,055	339,416	28.9%	330,960	R 4,320	R 11,400	R 24,000	R 16,817
FS Male Matric	26,088	44,809	75,571	37.2%	75,012	R 13,200	R 31,200	R 65,448	R 43,290
FS Male Tertiary	5,688	3,055	41,191	6.9%	42,616	R 48,000	R 81,000	R 146,200	R 105,810
FS Female None to GET	323,218	192,845	249,948	43.6%	239,055	R 2,400	R 4,800	R 9,284	R 8,800
FS Female Matric	37,622	54,802	51,405	51.6%	48,615	R 12,000	R 24,000	R 43,200	R 28,589
FS Female Tertiary	7,717	10,089	40,178	20.1%	39,927	R 34,000	R 60,000	R 72,000	R 59,337
KZ Male None to GET	718,305	465,098	749,348	38.3%	700,900	R 7,092	R 13,200	R 24,000	R 20,720
KZ Male Matric	85,766	153,074	264,303	36.7%	265,739	R 15,600	R 30,000	R 55,944	R 42,984
KZ Male Tertiary	23,026	19,559	136,732	12.5%	137,194	R 42,000	R 72,000	R 139,000	R 105,207
KZ Female None to GET	1,077,522	509,231	800,656	38.9%	630,146	R 3,720	R 6,000	R 12,000	R 10,225
KZ Female Matric	157,249	191,954	225,188	46.0%	216,712	R 10,400	R 20,200	R 36,000	R 27,652
KZ Female Tertiary	24,286	29,876	147,438	16.8%	150,176	R 30,000	R 48,000	R 70,000	R 56,956

Table 15 continued…

	Adult labour market status at time of interview				Employed (reported income)	Distribution of wages (Rand, 2000 prices)			
	Not econ active	Unemployed	Employed	Unemp. rate		25th Per centile	Median	75th Per centile	Mean wage
NW Male None to GET	324,448	190,142	382,864	33.2%	384,966	R 7,800	R 16,800	R 25,392	R 20,257
NW Male Matric	27,641	61,714	94,746	39.4%	90,874	R 14,400	R 27,600	R 54,000	R 50,463
NW Male Tertiary	5,039	6,193	41,319	13.0%	40,857	R 45,900	R 69,600	R 96,000	R 81,539
NW Female None to GET	460,465	261,108	231,212	53.0%	226,699	R 3,600	R 6,600	R 12,200	R 10,299
NW Female Matric	48,795	83,277	51,433	61.8%	48,647	R 9,600	R 23,400	R 42,000	R 30,181
NW Female Tertiary	11,442	14,797	48,058	23.5%	46,425	R 25,200	R 45,600	R 63,000	R 48,140
GT Male None to GET	470,465	400,459	927,039	30.2%	952,358	R 10,608	R 18,000	R 28,800	R 23,281
GT Male Matric	93,848	150,684	416,020	26.6%	419,112	R 18,000	R 31,000	R 63,000	R 47,551
GT Male Tertiary	31,580	29,854	288,067	9.4%	281,779	R 54,012	R 96,000	R 180,000	R 149,166
GT Female None to GET	662,942	525,882	629,463	45.5%	654,184	R 6,000	R 10,400	R 18,000	R 15,615
GT Female Matric	151,410	181,935	294,898	38.2%	294,874	R 14,400	R 26,000	R 45,600	R 35,281
GT Female Tertiary	47,567	38,825	233,075	14.3%	230,981	R 42,000	R 63,000	R 96,000	R 82,683
MP Male None to GET	243,571	120,089	311,062	27.9%	300,020	R 6,000	R 12,800	R 25,800	R 20,585
MP Male Matric	17,598	36,872	82,335	30.9%	81,077	R 12,000	R 24,000	R 50,080	R 45,569
MP Male Tertiary	2,035	5,598	35,787	13.5%	32,613	R 48,000	R 90,960	R 126,038	R 90,604
MP Female None to GET	350,793	182,586	253,645	41.9%	224,113	R 3,120	R 5,640	R 9,600	R 8,619
MP Female Matric	37,242	80,245	54,434	59.6%	54,296	R 5,004	R 12,000	R 28,008	R 20,736
MP Female Tertiary	5,158	12,291	38,677	24.1%	35,919	R 31,280	R 55,175	R 79,200	R 58,278
LP Male None to GET	565,106	235,548	336,299	41.2%	316,729	R 5,000	R 8,608	R 19,200	R 16,377
LP Male Matric	33,694	70,000	79,362	46.9%	75,530	R 6,000	R 21,000	R 54,000	R 44,288
LP Male Tertiary	5,635	15,736	59,193	21.0%	58,096	R 36,000	R 60,900	R 94,524	R 74,293
LP Female None to GET	829,738	333,524	324,794	50.7%	286,420	R 3,000	R 4,800	R 9,000	R 9,111
LP Female Matric	54,989	106,212	66,166	61.6%	60,937	R 4,560	R 12,000	R 30,000	R 22,880
LP Female Tertiary	6,022	28,076	64,139	30.4%	63,669	R 31,200	R 50,500	R 74,000	R 54,464
Total	10,079,664	6,510,370	11,619,653	35.9%	11,056,552	R 6,480	R 15,600	R 36,000	R 32,890

Source: IES/LFS 2000

Notes: Population estimates include only adults, i.e. all children under the age of 15 are excluded. Employment estimates in the 3rd column reflects the employment status under the expanded definition. The numbers in the 5th column reflect the number of people that reported positive wages for the period, hence this may include people that were unemployed at the time. Conversely, this column may also exclude people that are employed but failed to report wage income, or self-employed people that reported income under another income category, e.g. income from GOS.

4.5.   Data matrices for inclusion in the SAM and for use as satellite accounts

Once the household and factor groups were determined, the structural information for all the sub-matrices in the household and factor (labour) rows and columns of the SAM were estimated using the IES/LFS 2000. Four satellite accounts from the IES/LFS 2000 were also constructed as described below. A number of key issues are highlighted here. In total there are approximately 900 questions in the IES 2000 questionnaire covering all income and expenditure-related activities of households during a particular period. All monthly figures were annualised and each of the income and expenditure items in the IES 2000 was mapped to a particular account of the SAM.

4.5.1.   SAM accounts

Expenditure items in the IES 2000 provide the information on *household expenditure* incorporated in the household column of the SAM and include: a) the value of each household's consumption of each of the commodities included in the SAM (SM1:4)[15], b) total inter-household transfers by each household (SM4:4), c) income tax per household (SM6a:4), and d) household savings (SM7a:4). Household expenditure on domestic services reported in the IES 2000 was treated as compensation of employees by creating an additional activity account for domestic services (see section 7.2.1). No information was available in the IES 2000 on transfers to government (SM6b:4) and seeing that it is a fairly small per centage of household expenditure, equal shares per household was assumed and final values were determined by the balancing process. For transfers to the rest of the world (SM8:4) there was no data available form the IES 2000 and it was assumed that foreign transfers follow the same distribution pattern as domestic transfer payments (inter-household payments).

Data on *household income* obtained from the IES 2000 include information on income from: a) non-labour factors of production such as capital (gross operating surplus) (SM4:3a), b) labour (SM4:3b), c) inter-household transfers (SM4:4), d) enterprises (SM4:5), and e) transfers from central government (SM4:6b). The IES 2000 information on labour income provides the control total for total household income from labour per household, while the share of labour income per labour category is derived from the LFS 2000:2. The merged IES/LFS 2000 is needed to determine ownership of labour by each household group. Estimates of income from transfers from the rest of the world (SM4:8) are not reported in the IES 2000 therefore similar patterns of income are assumed as for domestic transfers.

Data on *inter-household transfers* (SM4:4) in the IES 2000 are problematic for two reasons: a) the national-level transfer payments by households are not equal to the national-

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[15] For sub-matrix numbers refer to national accounting matrix (NAM) in Table 16.

level transfer receipts reported by households, and b) there is no information that can be used to map incomes and receipts between different representative households. The information collected from the IES 2000 provides the row and column totals of the inter-household transfers sub-matrix (matrix T). Cell t_{ij} of matrix T is calculated as

$$t_{ij} = \frac{\sum_j t_{ij} \cdot \sum_i t_{ij}}{\sum_i \sum_j t_{ij}}$$

where *i* and *j* denote the rows and columns respectively. It can be verified that summing the above expression over *j* gives the vector of column (expenditure) totals, while summing over *i* gives the vector of row (income) totals. The sum of all the cells is of course the total value of transfer incomes or payments. The next step is to calculate the net receipts of each household group. This can be done by subtracting from matrix *T* its transpose, thus giving a symmetrical matrix $T^s = T - T'$ for which $t_{ij} = -t_{ij}$. All diagonal entries of the net transfers matrix are zero ($t_{ij} = 0$ for all $i = j$). The final inter-household transfer matrix is created by keeping all positive entries and setting all negative entries equal to zero. See PROVIDE Technical Paper 2005:1 (PROVIDE 2005) for a more detailed description. The total of the inter-household transfers sub-matrix in the detailed SAM was derived by calculating household transfer expenditure reported in the IES2000 as a share of total household expenditure reported in the IES 2000 and multiplying this share by the total household expenditure in the NAM. The matrix coefficients of the inter-household transfers were then multiplied with this estimated sub-matrix total.

Data on *compensation of employees* was obtained from the LFS 2000:2. All employees report on the type of business they work in (indicated by an industry code) and the type of work they perform (occupation code). The industry codes are based on three-digit Standard Industrial Classification (SIC) codes (CSS, 1993). These codes are used to map respondents' activities to the 94 activities specified in the SAM. The latter is based on the activities specified in the use table published by Statistics South Africa. Unfortunately a perfect mapping is not possible, as the use table is more disaggregated in some activities. As a result only 50 unique activities can be identified. The factor-activity (or value-added) sub-matrix in the SAM (SM3b:2) is estimated initially for these 50 industries and then disaggregated to the 94 industries included in the use table published by Statistics South Africa by making use of shares of value added per industry included in the use table[16]. This sub-matrix summarises

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[16] For example, activity codes 5, 6, 7 and 8 in the use table represent meat products, fish products, fruit and vegetables products, and oils and fat products. In the LFS 2000:2 these all fall under the three-digit SIC code 301. From the use table we know that the value added shares across these activities are 35:16:33:16. These shares are used to disaggregate value-added payments (from activities to factors) as reported under SIC code 301 into four accounts under the assumption that the same value-added shares hold for all types of labour factors.

information on the flow of resources, in the form of wages or salaries, from each industry to each factor. The LFS 2000:2 does not report on either *labour income from the rest of the word* (SM3b:8) nor *labour payments to the rest of the world* (SM8:3b), therefore the initial estimates were equal shares per labour category and letting the balancing process determine the final values.

4.5.2. *Satellite accounts from the IES/LFS 2000*

In addition to the SAM there are also four satellite accounts compiled from IES/LFS 2000 data. The satellite accounts are sub-matrices of quantities that can be linked to corresponding value sub-matrices of the SAM. The satellite accounts include a) factor use by activity in terms of number of employees (SM3b:2), b) factor use by activity in terms of hours worked (SM3b:2), c) factor ownership by households in terms of number of employees (SM4:3b), and d) factor ownership by households in terms of hours worked (SM4:3b).

The satellite account data from the IES/LFS 2000 does not automatically enter the balancing process, hence during the balancing process the value of compensation of employees per activity and the factor payments to households are adjusted without proportionate adjustment to the number of employees and hours worked reported in the satellite accounts, with implications for average wages. Theoretically the most appropriate way of adjusting the number of employees or hours would be to divide total compensation of employees in the balanced SAM by the average wages (per employee or hour) calculated from the LFS data. Data problems however complicate the adjustment process.

The procedure that was followed to adjust the number of employees per activity is the following:
- The value of compensation of employees from the IES/LFS 2000 was scaled to the same matrix total as that of labour payments in the balanced supply and use SAM. This is necessary because the total value of compensation reported in the IES/LFS 2000 is lower than that reported in the national accounts, hence the total number of employees will increase during adjustment if average wages are calculated without scaling the total compensation of employees.
- The average wage per employee per activity is calculated by dividing the scaled values of compensation of employees from the IES/LFS 2000 by the number of employees per activity reported in the IES/LFS 2000.
- The adjusted number of employees, to correspond with the compensation of employees from the balanced SAM, is obtained by dividing the values of compensation of employees in the balanced SAM by the calculated average wages.
- The adjusted number of employees is approximately 200 000 less than the original number of employees and the number of employees in the adjusted factor use matrix are

scaled uniformly to increase by 200 000 to equal, in total, the original number of employees. This results in the new factor use matrix reporting number of employees per activity.

The procedure that was followed to adjust the hours worked per factor group per activity is the following:

- The average number of hours worked per factor group per activity was calculated by dividing the hours worked per factor group per activity reported in the IES/LFS 2000 by the number of employees per activity reported in the IES/LFS 2000.
- The average number of hours worked per factor group per activity was multiplied by the new factor use matrix reporting number of employees per activity to obtain the new factor use matrix reporting hours worked per factor group per activity.

It must be noted that the new factor use matrices for number of employees and hours worked still record the factor use by activity. Because of the derivation of the input-output SAM, the final SAM no longer has activity accounts, because the production accounts are classified on a commodity base. The changes to factor payments during the process of deriving the input-output table cannot be replicated easily for the factor use matrices, because these changes are the result of matrix multiplication. The factor use matrices therefore have to be used together with the factor payment by activity information contained in the supply and use SAM.

The two satellite accounts that relate to the sub-matrix of factor payments to households records factor (labour) ownership by household in terms of number of employees and hours worked respectively. The factor payments to households from the IES/LFS 2000, on which these two satellite accounts are based, were also adjusted as part of the balancing process. In order to derive the adjusted values for the number of employees within each factor group by household, as well as the number of hours worked a similar process was followed as for the satellite accounts for employment and hours worked by activity. An added complication is that at the end of the adjustments, the total number of employees per factor group reported in the sub-matrix related to compensation of employees per activity (row total of SM3b:2) must equal the total number of employees per factor group owned by households (column total of SM4:3b). The process to derive the adjusted satellite accounts for labour ownership by households is the following:

- The value of labour payments to households from the IES/LFS 2000 was scaled to the same matrix total as that of labour payments to households in the balanced supply and use SAM. This is necessary because the total value of payments reported in the IES/LFS 2000 is lower than that reported in the national accounts, hence the total number of employed

persons will increase during adjustment if average payments are calculated without scaling the total payments.

- The average payment per employed person per household is calculated by dividing the scaled values of labour payments to households from the IES/LFS 2000 by the number of employees per household reported in the IES/LFS 2000.

- The adjusted number of employed persons, to correspond with the labour payments to households from the balanced SAM, is obtained by dividing the values of labour payments by households in the balanced SAM by the calculated average payments.

- Despite the initial scaling, the adjusted number of employed persons is approximately 700 000 more than the original number of employed persons and the number of employed persons in the adjusted factor ownership matrix are scaled uniformly to decrease by 700 000 to equal, in total, the original number of employed persons.

- After this step the total number of employed persons for each factor group (sum across households) no longer corresponds to the total number of employees per factor group from the new satellite account for factor use by activity. The number of employed persons within each factor group is further scaled to ensure consistency between the total number of employees per factor group reported in both the satellite accounts (SM3b:2 and SM4:3b).

The procedure that was followed to adjust the hours worked per factor group per household is the following:

- The average number of hours worked per factor group per household was calculated by dividing the hours worked per factor group per household reported in the IES/LFS 2000 by the number of employed persons per household reported in the IES/LFS 2000.

- The average number of hours worked per factor group per household was multiplied by the new factor ownership matrix reporting number of employed persons per household to obtain the new factor ownership matrix reporting hours worked per factor group per household.

- After this step the total hours worked of employed persons for each factor group (sum across households) no longer corresponds to the total number of hours worked per factor group from the new satellite account for factor ownership by household. The number of employed persons within each factor group was therefore further scaled to ensure consistency between the total number of hours per factor group reported in both the satellite accounts (SM3b:2 and SM4:3b).

A few qualifications are necessary:

- The LFS/IES 2000 data does not allow for accurate calculation of average wages because questions related to total salary does not link directly to the number of hours worked,

hence it would be possible that a person report an annual salary as being the total salary earned for the year, but the person did not work for 12 months of the year.

- In the LFS 2000:2 there is a variable for 'hours usually worked in main job/activity', reported as total weekly hours. These values are not necessarily linked to a weekly wage to deduce the hourly wage.

- For purposes of this study to calculate the data on hours worked by factor, the variable hours usually worked per week was multiplied by 47 to get annual hours worked. This is based on 52 weeks per year, minus 3 weeks (15 days) annual leave (minimum as per Basic Conditions of Employment Act) minus 2 weeks (10 days) public holidays on average per year. This method could very well overestimate the total number of hours worked per year, and at the same time therefore lead to underestimation of hourly wages. There is however no sufficient information from which to determine the actual numbers worked per annum.

- The SAM is first and foremost designed to capture total flows of funds in an economy, hence the average payments calculated when using the satellite account data are not strictly average annual wages per employee or average hourly wages, but merely average payments, based on the best possible estimates of number of employees and hours worked.

5.   Technical overview of the treatment of Time Use Survey data

This section provides an overview of the data work that was performed on the original time use survey data. The time use survey questionnaire consisted of five sections. The data from different sections were recorded in separate files as they referred to different entities. The time use survey data was presented in flat, ASCII, fixed field files, with one line of given length per record (i.e. .*dat* format). Each of the files contained a unique household identifier (UQNR) of 11 digits, which allowed data from the different files to be linked. The first six digits of the identifier contain information on the province, magisterial district, and stratum of the household. The remaining five digits contain information relating to the dwelling unit number and the household number. Data was contained in the following files:

1   HHOLD: This contained data from section 1, the household questionnaire. Information such as the type of dwelling occupied by the household, household's main source of water, household's main source of energy/fuel for cooking, heating and lighting, household member responsible for collecting fuel and water, monthly household income and main sources of this income, and access to public transport, clinics, primary schools, secondary schools and shops is contained in this file. Information regarding each household member's gender, age and population group is provided, and the relationship of the one or two diary respondents to each of these

household members is provided. A variable for household stratum and another for household province are derived from the fourth and first digit of the unique household identifier number respectively.

2   PERSON: This file contained data from section 2 and section 4, namely information from the demographic questionnaire that was administered to each of the two individual respondents. Information such as the age, gender, race, education level and work status of the respondent was included in this file. In addition, the file contained a variable (PERSON), that together with the unique household identifier create a unique person identifier which can be used to link individual information in this file with individual information in other files.

3   DIARY: This contained data from section 3 and section 5, namely the first person diary and second person diary respectively. This file contains one record for every half-hour of the day. It therefore contains 48 records for every person who completed a diary. Up to three activities per timeslot could be recorded. This file also contained a variable (PERSON) that together with the unique household identifier creates a unique person identifier which could be used to link individual information in this file with individual information in other files.

4   MEMBER: This file contained one record for every household member recorded in the grid in section 1, and included basic demographic information on each of these household members, as well as their relationship to each of the two individual diary respondents. This file therefore contained between 1 and 24 records for each household.

The time use survey metadata contained two additional files, as follows:

1   ACTIVALL: This file contains one record for every activity that the respondent recorded in the diary. Where more than one activity was recorded for a time slot, then this file contains multiple records for that particular individual and time slot. The file contains at least 48 records for every individual who completed a diary. However, it could theoretically contain up to 144 records for an individual if three activities were recorded for each time slot. This file was constructed from the DIARY data with the intention of allowing easier analysis of all recorded activities.

2   EPISODE: This file was used to accumulate consecutive identical activities, termed episodes, into single records.

This data was read into STATA using dictionary files, and saved in STATA format (i.e. *.dta* format). The MEMBER, HHOLD, PERSON, and DIARY files were used for the

analysis. The MEMBER file was merged with the HHOLD file for the creation of the household groups. The resultant file was merged with the PERSON file, following the creation of the factor groups using the PERSON file. This file was subsequently merged with the DIARY file, which had been used to create various paid and unpaid time use activities and to calculate time spent on these activities by the diary respondents. Therefore the two files that were not used for the analysis were the ACTIVALL and EPISODE files.

5.1. Creating Household Groups

Household groups for the TUS were formed based on the same indicators as the household groups created for the SAM. Specifically, household groups were formed around an indicator of geographical location of the household's residence (formal and informal urban areas, 'commercial' rural areas and other rural areas, which formed part of the former homelands) and the race (African, Coloured/Asian and White) of the household. Coloured and Asian initially formed two separate groups; however, due to the limited sample size they were grouped together, and re-labelled *"Col/Asian"*. The variable *"stratum"* referred to the geographic location of the household. It was assumed that no Coloured/Asian or white households lived in rural ex-homeland areas, and therefore these observations were re-classified as rural commercial. Similarly, it was assumed that no Coloured/Asian or white households lived in urban informal areas, and therefore these observations were re-classified as urban formal. Finally, each sub-group was divided further into income groups, using the per capita household income as criterion. A total of five income groups were created in the initial analysis, namely ultra poor, poor, low-middle income, upper-middle income, and high income, by splitting households around the 25th, 50th, 75th and 90th percentiles of per capita income. This resulted in a total of 36 household groups being created in the initial stage of the analysis.

It was subsequently decided to reduce the number of household groups to twenty. This was achieved by re-classifying the low-middle income, upper-middle income, and high-income groups as non-poor. Thus, the number of income groups was reduced from five to three, with the remaining income groups being ultra poor, poor and non-poor.

The time use survey only contained a variable on the usual monthly income of the household (Q113INCO). Respondents were asked to indicate their monthly income based on a range of ten values, and for the purposes of this study, the mid-point value for each category

was allocated as the actual monthly income per household[17]. Annual per capita income was calculated by dividing monthly household income by the household size, and then multiplying by 12. Income data was recorded as missing for 458 observations. In order not to lose these observations and thereby further reduce the sample, it was decided to impute income values for these observations. Income values were imputed based on the following demographic indicators, which in previous studies have been shown to be reliable predictors of income: the household's main source of income (Q112SOUR), the household's main source of lighting energy (Q13LIGHT), and the household's main source of water (Q16WATER).

5.2.   Creating Factor Groups

Initially, 24 factor groups were created, based on region of residence[18], gender and education level. However, it was subsequently decided to reduce the number of factor groups to four, based on gender and education level only. The number of education levels was also reduced from three to two, as described below.

In the initial stage of the analysis, the following three categories for education level were created[19]:
- None, GET and other;
- Matric; and
- Tertiary

The number of education levels was subsequently reduced to two, by merging the matric and tertiary education levels. This resulted in the following two education levels:
- GET or below
- Above GET

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[17] The categories were as follows (with mid-point shown in brackets):

R0 – R399	(R200)
R400 – R799	(R600)
R800 – R1 199	(R1000)
R1 200 – R1 799	(R1 500)
R1 800 – R2 499	(R2 150)
R2 500 – R4 999	(R3 750)
R5 000 – R9 999	(R7 500)
R10 000 or more	(R15 000)
Don't know	
Refusal	

[18] The four regions that were created in the initial stage of the analysis, based on the nine provinces of South Africa, were as follows:
- West Coast: This region covers the Western Cape and the Northern Cape
- East Coast: This region includes the Eastern Cape and KwaZulu-Natal
- Central: This region consists of Free State, North West and Gauteng
- Border: This region includes Mpumalanga and the Northern Province

[19] The rationale for creating these three education levels is discussed in section 4.4.3.

Therefore, the resultant four factor groups that were created were:
- Male, GET or below
- Male, above GET
- Female, GET or below
- Female, above GET

5.3.   Calculating Time Use by Activities

The primary objective of these files is to allocate minutes to each of the A, and, if more than one activity was performed per time slot, to the B and C activities, as well as to create various time use activity groups.

Minutes were allocated to A, B and C activities. It was decided to use an approach similar to that utilised by SSA for the majority of the analysis and tables presented in its time use survey report, namely the total minutes approach, whereby the total minutes per person per day would sum to 24 hours. If only one activity was performed per time slot, it was obvious that this activity took half an hour, and so thirty minutes was allocated to the activity in that time slot. If two activities were performed in a particular time slot, then each activity was allocated 15 minutes, whilst if three activities were performed in a particular time period, then each activity was allocated 10 minutes.

The following time use activity groups were created, with their corresponding activity codes shown in brackets:
- 1 – Water and Fuel Collection (250, 258, 236)
- 2 – Social Care (510 to 590, 610 to 690)
- 3 – Home Maintenance (410 to 498)
- 4 – Unproductive Time (010 to 090, 710 to 790, 810 to 890, 910 to 990)
  - o 41 – Leisure (710 to 790, 810 to 890, 910 to 990)
  - o 42 – Sleep (010)
  - o Necessary Care (020 to 090)
- 5 – SNA Production (111 to 190, 210 to 230, 240, 260 to 290, 310 to 390)
- 6 – Unclassified

In the initial stage of the analysis, eight time use categories were created. However, these were subsequently reduced to the six categories listed above, due to problems associated with the small number of observations for certain of the categories. The initial eight categories that were created were as follows:
- 1 – Collecting water
- 2 - Collecting fuel
- 3 – Social care
  - o 31 – Child care
  - o 32 – Social care
- 4 – Health care

- 5 – Home maintenance and community services
    - o 51 – Preparing food and drinks
    - o 52 – Cleaning and upkeep of dwelling
    - o 53 – Other home maintenance
    - o 54 – Community services
- 6 – Leisure and personal care
    - o 61 – Leisure
    - o 62 – Sleep
    - o 63 – Necessary care
    - o 64 – Receiving care
- 7 – SNA Production
- 8 – Unclassified

The amount of time spent (in minutes) per person per day on each of these activities was calculated separately for each of the A, and, if applicable, B and C activities. The total amount of time (in minutes) spent overall per person per day on each of these activities was then calculated as the sum of the A, B and C activities for that particular time use activity, as TTUS1, TTUS2, TTUS3 etc. The variable TTUS was calculated as the sum of TTUS1 – TTUS6 in order to confirm that each respondent's time use per day summed to 24 hours.

5.4.   Creating the Labour Force Status Variable

In this file, the variable *"ECSTAT"* is created to indicate the labour force status of each individual aged between 15 and 65 years old. The ECSTAT variable is labelled as follows:
- 1 if the respondent is employed
- 2 if the respondent is unemployed
- 3 if the respondent is not economically active
- 4 if the respondent is not of working age

The ECSTAT variable was created in order to calculate total time use spent on various activities by household and factor groups according to employment status.

5.5.   Problems Encountered with the Time Use Survey

The issues raised in this section relate to our recent experience of using the Time Use Survey. These issues should not necessarily be portrayed as proposals for improvement of the Time Use Survey, because the IES 2005 is due for release shortly and it is worth waiting to see how the issue of time use was handled in this survey before making suggestions pertaining to how best to improve the Time Use Survey. Our comments relating to the Time Use Survey can be divided into two –namely those issues that pertain to our study in particular, and secondly, issues that pertain to studies of this nature in general.

The following issues pertained to our study in particular:

Head of Household: The Time Use Survey does not identify which member is the head of the household, and therefore there is also no variable for the gender of the head of the household. This makes it more difficult to use the Time Use Survey in conjunction with other surveys, and similarly makes comparisons across surveys difficult.

Measurement of Education: The questionnaire firstly asks each of the one or two diary respondents to identify their highest level of school education completed. Respondents have to identify the highest grade/class/standard at school that they passed, out of a comprehensive list of thirteen options that range from "None" to "Grade 12/Standard 10/Matric". Thereafter, respondents are asked to indicate whether they have completed further studies after completing school. Unfortunately, this question consists of a basic "Yes/No" answer, and fails to capture the nature and level of the tertiary studies completed by the individual. In particular, it would be beneficial to know whether the post-school studies consisted of an undergraduate degree or diploma, postgraduate degree or diploma, the field of study, and possibly the duration of study.

Issues that pertain to studies of this nature in general include the following:

Sample Size: The relatively small sample size of the Time Use Survey limits the level of disaggregation of cohorts. If the costs associated with the survey were not an issue, it would be beneficial if the Time Use Survey consisted of a larger sample size.

Number of Diary Respondents per Household: A maximum of two people from each household were questioned and asked to keep a diary. It is unfortunate that not *all* the eligible household members were given the task of completing a diary. In a sense, potentially valuable information is "lost". By only requiring a maximum of two individuals per household to complete the diary, the representivity of the sample is affected.

A problem that was also raised in the Statistics South Africa Time Use Survey report concerns the accuracy of the derived labour force variable in the Time Use Survey. An example of one such problem is that the derived labour force variable classifies some individuals as unemployed even although these individuals clearly engage in SNA activities. The reason for this discrepancy is unclear and warrants further investigation.

The diary is restricted to individuals aged 10 years or over. In a developing country such as South Africa, it might be both interesting and valuable to know how time use differs amongst children of each gender. Thus, the Time Use Survey effectively ignores an important sector of the population. In other words, it would be interesting to know whether, and if so how, daily time use differs between boys and girls, *including* those aged 10 years or less.

6. Compiling a National Accounting Matrix (NAM) for South Africa

The National Accounting Matrix (NAM) for South Africa (see Table 16) provides the control totals for each of the sub-matrices of the detailed national SAM for South Africa. The base year for the NAM is 2000. The main data source that was used is the Quarterly Bulletin of December 2004 published by the South African Reserve Bank (SARB, 2004). A key figure for a SAM, which is not published by SARB, is gross output by activities. The annual production accounts in Table 12 of Statistical Release P0441 published by Statistics South Africa (SSA, 2004) provided an estimate of gross output at basic prices.

A few issues need to be highlighted:

- The NAM follows the structure of a supply and use SAM. The derivation of the input-output SAM takes place after the development of the detailed supply and use SAM.
- Only net inter-household transfers are typically recorded in a SAM. Therefore inter-household transfers in the NAM are zero. Inter-household transfers are recorded in the detailed SAM as discussed in section 7.
- Details on margins are obtained from the SU-tables and do not enter into the NAM, but are recorded in the detailed supply and use SAM as discussed in section 7. The margins are however absorbed into the commodity and activity accounts when deriving the reduced form SAM.

Table 16: A NAM for South Africa for 2000 (R million), based on SARB data

		1	2	3a	3b	4	5	6a	6b	7a	7b	8
		Commodities	Activities	Factors		Households	Enterprises	Government		Capital		Rest of World
				Capital	Labour			Taxes	Expend	Investment	Stock changes	
1	Commodities	0	1 055 468	0	0	580 802	0	0	167 348	139 648	7 096	257 011
2	Activities	1 893 686	0	0	0	0	0	0	0	0	0	0
	Factors											
3a	Capital	0	377 770	0	0	0	0	0	0	0	0	15 190
3b	Labour	0	442 301	0	0	0	0	0	0	0	0	2 242
4	Households	0	0	94 883	440 299	0	112 441	0	29 687	0	0	260
5	Enterprises	0	0	143 628	0	0	139 834	0	51 747	0	0	0
	Government											
6a	Taxes	83 930	18 147	0	0	87 848	33 248	0	0	0	0	0
6b	Income	0	0	0	0	1 870	9 687	223 173	0	0	0	481
	Capital											
7a	Savings	0	0	119 237	0	6 922	39 919	0	-20 526	0	0	1 192
7b	Stock changes	0	0	0	0	0	0	0	0	7 096	0	0
8	Rest of World	229 757	0	35 212	4 244	128	80	0	6 955	0	0	27 254
9	Totals	2 207 373	1 893 686	392 960	444 543	677 570	335 209	223 173	235 211	146 744	7 096	303 630

Each row of the NAM is discussed separately. The rows and columns in Table 16 are numbered for the reader to identify the relevant sub-matrix that is referred to, e.g. household consumption in the sub-matrix in the first row and fourth column will be referred to as SM1:4. If more than one description appears, the first corresponds to the sub-matrix descriptions in Table 1 and the second to the descriptions of the totals in the SARB Quarterly Bulletin. The numbers at the end indicate the code used in the SARB Quarterly Bulletin followed by the page number.

6.1.   Commodity row

SM1:1   Marketing Margins: Net margins equal zero and no control total reported, therefore derived as part of detailed SAM;

SM1:2   Intermediate consumption: Table 12, Statistical Release P0441 (Stats SA, 2004);

SM1:4   Final consumption expenditure by households 6007J S-112;

SM1:6b   Final consumption expenditure by general government 6008J S-112;

SM1:7a   Investment: Gross fixed capital formation 6009J S-112, plus the reported residual 6011J S-112;

SM1:7b   Stock changes: Change in inventories 6010J S-112;

SM1:8   Exports: Exports of goods and services 6013J S-112;

6.2.   Activity row

SM2:1   Supply of commodities by activities: The value of intermediate consumption: Table 12, Statistical Release P0441 (Stats SA, 2003a), plus the gross value added at basic prices 6645J S-112.

6.3.   Factor rows

SM3a:2   GOS income: Net operating surplus 6001J S-112, plus consumption of fixed capital 6002J S-112;

SM3a:8   GOS income from Rest of the World: Direct investment 5704J S-90, and non-direct investment 5705J S-90.

SM3b:2   Labour income: Compensation of Employees 6000J S-112;

SM3b:8   Labour income from Rest of the World: Compensation of employees 5703J S-90.

6.4.   Household row

SM4:3a   Income to households from non-corporate business enterprises balances the GOS account: Net operating surplus 6001J S-112, less net operating surplus of incorporated business enterprises 6220J S-135, less GOS payments to rest of the world 5724Y + 5725Y S-90, plus GOS receipts from rest of the world 5704Y + 5705Y S-90;

SM4:3b   Income to households from labour: Compensation of employees 6240J S-137;

SM4:4   Inter-household transfers: Net transfers are zero in a NAM, therefore discussed as part of the detailed SAM in section 7.1.4;

SM4:5   Household income from incorporated business enterprises: Income from property 6241J S-137, plus current transfers from incorporated business enterprises 6231J S-137, less income to households from non-corporate business enterprises (SM6:3);

SM4:6b   Government transfers to households: Current transfers from general government 6257J S-137;

SM4:8   Remittances from rest of the world: Current transfer receipts - other sectors 6243J S-137.

6.5.   Enterprise row

SM5:3a   Distribution of factor income: Net operating surplus 6220J S-135;

SM5:5   Transfers to enterprises: Net income calculated as enterprise account residual;

SM5:6b   Government transfers: Interest on public debt 6255J S-136.

6.6.   Government rows

SM6a:1   Net commodity taxes: Taxes on products 6603J S-112 less subsidies on products 6604J S-112;

SM6a:2   Net production (activity) taxes: Other taxes on production 6600J S-112 less other subsidies on production 6601J S-112;

SM6a:4   Household tax: Current taxes on income and wealth 62451J S-137;

SM6a:5   Enterprise tax: Current taxes on income and wealth 62301J S-135.

SM6b:4   Transfers from households: Current transfers receivable from households 6252J S-136;

SM6b:5   Transfers from enterprises: Income from property 6250J S-136, plus current transfers receivable from incorporated business enterprises 6232J S-136;

SM6b:6a Transfer from tax accounts to general government: taxes on production 6603J S-136, plus other taxes on production 6600J S-136, less subsidies on products 6604J S-136, less subsidies on production 6601J S-136, plus current taxes on income and wealth 6251J S-136;

SM6b:8   Transfers from rest of the world 6253J S-136;

SM6b: Total government income: Current income 6254J S-136, less subsidies 6005J S-136.

6.7.   Capital and stock changes rows

SM7a:3a GOS savings: Consumption of fixed capital 6002J S-132;

SM7a:4   Household savings: Savings by households 6200J S-132;

SM7a:5   Savings by enterprises: Corporate savings 6201J S-132, plus residual 6011J S-112;

SM7a:6b   Government savings: Saving of general government 6202J S-132;

SM7a:8   Capital account balance: Foreign investment 6206J S-132;

SM7a:9   Total savings: Gross capital formation 6180J S-132 plus residual 6011J S-112.

SM7b:7a   Stock changes: Change in inventories 6010J S-112.

6.8. Rest of the World row

SM8:1   Imports: Imports of goods and services 6014J S-112;

SM8:3a   Factor payments to rest of world: Direct investment income 5724Y, plus non-direct investment income 5725Y S-90;

SM8:3b   Factor payments to rest of world: Income payments - compensation of employment 5723Y S-90;

SM8:4   Household remittances: Transfers to the rest of the world 6248J S-137;

SM8:5   Enterprise payments to rest of the world: Current transfers to the rest of the world 6233J S-135;

SM8:6b   Government transfers to the rest of the world: Current transfer payments - central government 5727Y S-90;

SM8:8   Current account balance: Merchandise exports 5000J S-86, plus net gold exports 5001J S-86, plus service receipts 5002J S-86, less merchandise imports 5003J S-86, less payments for services 5004J S-86.

7. Compiling a best estimate (unbalanced) detailed SAM for South Africa

A best estimate SAM refers to a SAM that is compiled from different, usually inconsistent, data sources that leads to a SAM for which the row and column totals usually do not equate. The process of deriving the best estimate SAM is discussed here, while the estimation of the missing data to derive a complete and consistent SAM is discussed in section 8.

7.1. The Best Estimate Programme

The best estimate SAM is an unbalanced SAM that contains data from different sources that have not been reconciled. Data for each of the sub-matrices are derived from various data sources and organized according to the accounts included in the SAM. The data by sub-matrix and any other data, such as control totals, are then included in an Excel workbook. A program in GAMS is used to organize the data in SAM format. The program developed for the national SAM furthermore ensures that the total of each of the sub-matrices of the SAM is consistent with that of the NAM. This feature facilitates the estimation process and allows for a first check on accuracy in the GAMS code. It also implies that the original data that are read into GAMS provide the coefficients, shares or structural information, which are then

multiplied with the control totals from the NAM. There is an amount of subjectivity in the way in which the shares are calculated, i.e. column coefficients vs. income (row) shares. The methods of calculation are therefore discussed here in more detail.

In SAM development, data are used mainly for one of two purposes: either to provide a control total for an account or sub-matrix, or to provide structural information or coefficients, which can be multiplied by a control total, thereby deriving values, the total of which will be consistent with the mentioned control total. As discussed in section 0, the control totals for each of the sub-matrices of the national SAM are provided by the NAM in Table 16. Structural information can include row, column or matrix coefficients, where row coefficients will sum to one when summing across the row, columns coefficients will sum to one when summing down the column and matrix coefficients will sum to one when summing across the entire matrix.

The description of how the data were handled is carried out according to the rows of the SAM and the sub-matrices within each row. The same convention is thus followed as for the NAM presented in Table 16 and discussed in section 0.

7.1.1.   Commodity row

SM1:1   *Marketing margins.* The supply table (SSA, 2006) reports total margins per commodity, with the balancing items (negative entries) recorded for trade (C85) and transport (C87) respectively. The ratio between the two balancing items is used to split trade and transport margins for all other commodities, hence the relative contribution of trade and transport margins respectively to total margins for each commodity will be the same. The margins paid on various commodities, i.e. the positive entries in the supply table, are distinct from the margins received by C85 and C87 (negative entries). Hence for purposes of the detailed SAM two additional accounts are created to capture the transactions on trade and transport margins. The margin row accounts capture the positive margin entries in the supply table, while the margin column accounts capture the reported negative entries as positive entries. The model for which this SAM is used however does not require that margins are explicit therefore the margins were absorbed into the supply and use matrices of the balanced SAM before deriving the input-output SAM. The margins are absorbed pro-rate into the supply block, with proportionate adjustment of intermediate consumption by trade and transport commodities in the use matrix.

SM1:2   *Intermediate consumption.* Intermediate input coefficients are derived from the use table for 2002, using matrix shares of the intermediate input use section of the use table. These shares are then multiplied with the control total from the NAM.

SM1:4   *Final consumption expenditure by households.* Matrix shares are derived from the consumption expenditure data reported in the IES 2000. These shares are then multiplied with the control total from the NAM.

SM1:6b   *Final consumption expenditure by general government.* All government consumption demand is recorded as consumption of the commodity General Government services according to the use table for 2002. Consumption of General Government services by government is therefore equal to the NAM total for this sub-matrix.

SM1:7a   *Investment.* The control total is taken from the relevant sub-matrix of the NAM. The commodity (column) shares are derived from the use table for 2002, the data indicated as 'F5 Fixed Capital Formation'.

SM1:7b   *Stock changes.* The control total is taken from the relevant sub-matrix of the NAM. The commodity (column) shares are derived from the use table for 2002, the data indicated as 'F6 Changes in Inventories'.

SM1:8   *Exports of goods and services.* The control total is taken from the relevant sub-matrix of the NAM. The commodity (column) shares are derived from 2000 trade data for South Africa obtained from calculations based on data from SARS, Statistics South Africa and Global Insight. Refer to section 3.6 and PROVIDE Technical Paper 2004:2 (PROVIDE, 2004) for details about mapping and organising the trade data for inclusion in the SAM. This follows the process for previous PROVIDE SAMs, which also required trade data at provincial level.

7.1.2.   Activity row

SM2:1   *Supply of commodities by activities.* The supply table for 2002 provides the structural information for production of commodities by activities. The supply of domestic services is derived separately as there is no commodity for 'domestic services' in the supply table. The supply of domestic services must equal demand of domestic services by households. Hence the control total is taken from the supply matrix of the NAM (SM2:1) less total demand for domestic services by households captured in SM1:4 as part of the priors that have already been calculated from the IES data. In the first step the matrix shares calculated from the supply table are multiplied with the reduced NAM total. In the second step the production of domestic services by domestic services activity is set equal to the demand for domestic services by households. Also see section 7.2.1 for a more detailed discussion on domestic services.

SM3a:2   *GOS income*. The control total is taken from the relevant sub-matrix of the NAM. The row coefficients of GOS income by activity are derived from the use table for 2002.

SM3a:8   *GOS income from Rest of the World*. The value is taken from the relevant sub-matrix of the NAM.

SM3b:2   *Labour income*. The control total is taken from the relevant sub-matrix of the NAM. In the first step estimates of payments to all labour by each activity is derived from the row shares of the use table for 2002, the data indicated as 'V2 Compensation of Employees'. In the second step the column coefficients for payments to each labour group per activity, derived from the data contained in the LFS 2000:2 and the IES 2000, are multiplied by the estimates of payments per activity of the first step. For a more detailed description on how the labour groups were derived, see section 4.4. The payments to labour for domestic services by households, which are recorded as part of household consumption in the IES 2000, are included in this sub-matrix (see section 7.2.1).

SM3b:8   *Labour income from Rest of the World*. The control total is taken from the relevant sub-matrix of the NAM. To the knowledge of the author no information is available from which coefficients can be derived. Each labour category therefore is assumed to receive an equal proportion of the total labour income from abroad. If no labour income from activities is recorded for a specific labour account, that account will also receive no income from the Rest of the World.

7.1.4.   Household row

SM4:3a   *Income to households from non-incorporated business enterprises*. The control total is taken from the relevant sub-matrix of the NAM. The share per household are derived from GOS income reported in the IES 2000.

SM4:3b   *Income to households from labour*. The control total is taken from the relevant sub-matrix of the NAM. The first step is to estimate total labour income earned by each household, using column shares of labour income per household reported in the IES 2000. Secondly, the row shares of payments to each household from particular labour categories are determined, based on information derived from the LFS 2000. See section 4 for details on the handling of the survey data and forming of representative household and factor groups.

SM4:4   *Inter-household transfers*. No control total is available from the NAM. A control total was derived by using the share of total household expenditure for all households paid in the form of transfers, multiplied by the NAM total for total household expenditure. The matrix coefficients of the inter-household transfers

were then multiplied with this estimated sub-matrix total (see section 4.5 for a description of how the matrix was derived).

SM4:5   *Household income from incorporated business enterprises.* The control total is taken from the relevant sub-matrix of the NAM. The column shares are derived from enterprise income reported in the IES 2000.

SM4:6b   *Government transfers to households.* The control total is taken from the relevant sub-matrix of the NAM. The column shares are derived from government transfers reported in the IES 2000.

SM4:8   *Remittances from rest of the world.* The control total is taken from the relevant sub-matrix of the NAM. Row shares of the distribution of foreign transfer receipts is weighted according to each household's share of total (national) transfer receipts, i.e. foreign transfers follow the same distribution pattern as domestic transfers.

7.1.5.   *Enterprise row*

SM5:3a   *Distribution of factor (GOS) income.* The value is taken from the relevant sub-matrix of the NAM.

SM5:5   *Transfers to enterprises.* The value is taken from the relevant sub-matrix of the NAM.

SM5:6b   *Government transfers.* The value is taken from the relevant sub-matrix of the NAM.

7.1.6.   *Government rows*

SM6a:1   *Net commodity taxes.* The control total is taken from the relevant sub-matrix of the NAM. The row shares of net taxes by commodity are based on the shares of net taxes by commodity as derived from data indicated as 'V3 - Taxes Less Subsidies on Product' in the supply table for 2002.

SM6a:2   *Net production (activity) taxes.* The control total is taken from the relevant sub-matrix of the NAM. The row shares of net taxes by activity are based on the shares of net taxes paid by each activity as derived from data indicated as 'V6 – Other Taxes Less Subsidies on Production' in the use table for 2002.

SM6a:4   *Household income taxes.* The control total is taken from the relevant sub-matrix of the NAM. The row shares are based on direct taxes as reported in the IES 2000.

SM6a:5   *Enterprise tax.* The value is taken from the relevant sub-matrix of the NAM.

SM6b:4   *Transfers from households.* The control total is taken from the relevant sub-matrix of the NAM. To the knowledge of the authors no information are available from which coefficients can be derived. It was assumed that each household transfers an equal share.

SM6b:5   *Transfers from enterprises*. The value is taken from the relevant sub-matrix of the NAM.

SM6b:6a   *Transfer from tax accounts to general government account*. The sum total of government tax income is calculated from the government tax row.

SM6b:8   *Transfers from rest of the world*. The value is taken from the relevant sub-matrix of the NAM.

7.1.7.   Capital and stock changes rows

SM7a:3a   *GOS savings*. The value is taken from the relevant sub-matrix of the NAM.

SM7a:4   *Household savings*. The control total is taken from the relevant sub-matrix of the NAM. The row shares are based on data on household savings reported in the IES 2000.

SM7a:5   *Savings by enterprises*. The value is taken from the relevant sub-matrix of the NAM.

SM7a:6b   *Government savings*. The value is taken from the relevant sub-matrix of the NAM.

SM7a:8   *Capital account balance*. The value is taken from the relevant sub-matrix of the NAM.

SM7b:7a   *Stock changes*. The value is taken from the relevant sub-matrix of the NAM.

7.1.8.   Rest of the World row

SM8:1   *Imports*. The control total is taken from the relevant sub-matrix of the NAM. The row shares are derived from 2000 trade data for South Africa obtained from calculations based on data from SARS, Statistics South Africa and Global Insight. Refer to section 3.6 and PROVIDE Technical Paper 2004:2 (PROVIDE, 2004) for details about mapping and organising the trade data for inclusion in the SAM. This follows the process for previous PROVIDE SAMs, which also required trade data at provincial level.

SM8:3a   *Factor (GOS) payments to rest of world*. The value is taken from the relevant sub-matrix of the NAM.

SM8:3b   *Factor (Labour) payments to rest of world*. The control total is taken from the relevant sub-matrix of the NAM. To the knowledge of the authors no information are available from which shares can be derived. It was assumed that each non-zero factor account receives an equal share.

SM8:4   *Household remittances*. The control total is taken from the relevant sub-matrix of the NAM. Row shares of foreign transfer payments is weighted according to each household's share of total domestic transfer payments reported in the IES 2000, i.e. foreign transfers follow the same distribution pattern as domestic inter-household transfers.

SM8:5   *Enterprise payments to rest of the world.* The value is taken from the relevant sub-matrix of the NAM.

SM8:6b   *Government transfers to the rest of the world.* The value is taken from the relevant sub-matrix of the NAM.

SM8:8   *Current account balance.* The value is taken from the relevant sub-matrix of the NAM.

7.2.   Deviations from commodity and activity accounts in published supply and use tables

The commodity and activity accounts reported in Statistics South Africa's supply and use tables[20] were followed as closely as possible, and deviations are reported here:

- One additional account to record transactions by domestic services was created for both commodities and activities;
- Adjustment for crude oil usage;
- Aggregation of the detailed SU-table commodity and activity accounts to derive the desired accounts for purposes of the input-output SAM;
- Disaggregation of General Government Services, and Health and Social Work.

7.2.1.   Treatment of domestic services

Payments to domestic services are recorded in the IES 2000 as direct payments by households to labour. Table 17 illustrates a 100 unit payment by households to factors.

Table 17:   Factor payments by households

	Commodities	Activities	Factors	Households	Other	Total
Commodities						0
Activities						0
Factors				100		100
Households						0
Other						0
Total	0	0	0	100	0	

In order to treat the "selling" of domestic services to a household in a manner consistent with the treatment of other factors, the data in the SAM were rearranged. Two additional accounts were included in the SAM, a domestic services commodity and a domestic services activity for domestic services. The data was then rearranged as shown in Table 18. It is illustrated that the net effect of the incomes and expenditures for the accounts are the same as in Table 17. The domestic services activity is the only producer of the domestic services commodity. Furthermore, the only input used by this activity is labour.

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[20] See Table 46 for a list of activity accounts and corresponding SIC numbers.

Table 18:   Factor payments by activities

	Commodities	Activities	Factors	Households	Other	Total
Commodities				100		100
Activities	100					100
Factors		100				100
Households						0
Other						0
Total	100	100	0	100	0	

Domestic services are not recorded explicitly in the supply and use tables compiled by Statistics South Africa. Throughout the best estimate programme to compile the detailed SAM the domestic services accounts are treated separately from other labour accounts.

According to the SNA (1993) (paragraph 6.88) any intermediate costs and consumption of fixed capital incurred in the production of the domestic services are ignored and the value of the output produced is deemed to be equal to the compensation of employees paid, including any compensation in kind such as food or accommodation. The same value is, therefore, recorded under the household's final consumption expenditures.

7.2.2.   Adjustment of crude oil usage

Following the SU-table commodity and activity categories (SSA, 2003), crude oil is included in the "other mining" category. However, this category also includes many other economically important but very different commodities, including iron ore, diamonds and mining of chemical substances. A previous study on price changes in crude oil motivated the separation of crude oil from the aggregate "other mining" category and it was found that there exists substantial inconsistency between the SU-tables and other available information about the petroleum industry, namely that the use of petroleum is significantly understated. Specifically, the petroleum sector uses R10.9bn of the combined "other mining" commodity, while alternative sources (South African Petroleum Industry Association, 2003, and SARS imports data) suggest that the true value of only the crude oil component is R24.2bn. Detail of the procedure to correct for this under estimation is given in PROVIDE (2006).

Note that while the procedure adjusts some data, it causes some additional accounting imbalance in the prior SAM database, which is left for resolution during the cross entropy estimation procedure (see section 8). This is consistent with the logic of the estimation procedure, i.e. to estimate unknown data rather than impose arbitrary assumptions. The crude oil treatment is a key reason for differences between the PROVIDE SAM and the Stats SA SU-tables and related data. It is believed that the adjustments for crude oil results in a SAM that represents an improvement upon the previous version in terms of providing a more accurate reflection of the South African economy.

7.2.3. Aggregation to desired accounts

The commodity and activity accounts in the supply and use SAM were aggregated to the desired number of accounts for purposes of the study. The SIC descriptions of the commodity and activity accounts at the most detailed level follows that of the SU-tables of published by Statistics South Africa (SSA, 2003) and these descriptions are included in Table 46. The commodity and activity account aggregation that was followed for purposes of this study is included in the last column of Table 42.

7.2.4. Disaggregation of General Government and Health and Social Work

For purposes of the envisaged study with the input-output SAM the focus on the services sector required the disaggregation of the accounts for General Government, and Health and Social Work. The account for General Government was disaggregated into Education and Other Government, while the Health and Social Work account was disaggregated into Health Care and Social Care. The disaggregation is done in the supply and use SAM for the relevant commodity and activity accounts before the input-output SAM is derived. Little data was available therefore the disaggregation was done manually and balancing was done iteratively. The discussion starts with the disaggregation of the activity accounts for General Government and Health and Social Work.

SM2:1   *Supply of commodities by activities*. The supply table for 2002 indicates single product supply by General Government and Health and Social Work. This assumption was maintained, therefore the activity for Education was assumed to produce only Education as a commodity, and similarly for the other three new activity accounts. The values of supply for each of the four new accounts are set equal to the estimated column totals of the new accounts, to ensure balanced accounts.

SM1:2   *Intermediate consumption.* The distribution of intermediate consumption between the four new accounts was initially based on the shares of GOS income for each of the four accounts from the LFS 2002. Further information became available after the commodity accounts were disaggregated, hence these values were scaled to ensure balanced accounts.

SM3a:2   *GOS income*. The shares of GOS income for each of the four new accounts are based on data from the LFS 2002, because the LFS 2002 has the desired accounts explicitly recorded.

SM3b:2   *Labour income*. The shares of labour income per labour category for each of the four new accounts are based on data from the LFS 2002, because the LFS 2002 has the desired accounts explicitly recorded.

SM6a:2   *Net production (activity) taxes*. The net production tax distribution between the four new accounts was based on the shares of GOS income for each of the four accounts from the LFS 2002.

Here follows the discussion of the disaggregation of the commodity accounts for General Government and Health and Social Work:

SM1:2   *Intermediate consumption.* It was assumed that nearly all commodities produced by the new commodity accounts are consumed by their equivalent activity accounts. The remaining intermediate consumption (representing only 1.3 per cent of total commodity supply of the new accounts) was split arbitrarily.

SM1:4   *Household consumption.* According to the LFS 2002 data, all household consumption of General Government services relates to Education, implying zero household consumption of Other Government services, and all consumption of Health and Social Work relates to Health Care, implying zero household consumption of Social Work. In the case of Other Government Services, final consumption is accounted for by government expenditure from the government accounts. However there is no government expenditure on Health and Social Work, therefore in the absence of household consumption of Social Care, there would be no final consumption of Social Care, except for a minimal level of exports. Hence the level of Social Care for household consumption was set to ensure that the account was balanced. Consumption shares per household were derived from the Other Services commodity account, with the assumption that patterns of consumption of Social Care more closely resembles these Other Services than Health Care.

SM1:6b   *Government consumption.* The disaggregation of government consumption by Education and Other Government Services was based on the estimate that the value of government consumption of Education comprises approximately 20 per cent of total government consumption (Harsh, 2001).

SM1:8   *Exports of goods and services.* There are no exports for Education and Other Government Services and exports for Health and Social Care only comprise 0.8 per cent of the total output of Health and Social Care industry and these were split arbitrarily.

SM2:1   *Supply of commodities by activities.* The supply table for 2002 indicates single product supply by General Government and Health and Social Work. This assumption was maintained therefore the activity for Education was assumed to produce only Education as a commodity, and similarly for the other three new activity accounts. The values of supply for each of the four new accounts are set equal to the estimated column totals of the new accounts, to ensure balanced accounts.

SM6a:1 *Net commodity taxes*. The sales tax rate on Health Care and Social Care were kept similar to the tax rate of the joint account of Health and Social Work. The tax rate on General Government is approximately 0.7 per cent of total output and it was assumed that the tax rate on Education would be less than that on Other Government Services, therefore the tax rate for Education is set at 4 per cent and for Other Government Services is set at 9 per cent.

Some additional comments on the disaggregation are warranted. The disaggregation of the service accounts created a new focus area and highlighted some classification issues which has previously gone by unnoticed. According to the description of the SU-tables from Stats SA all education is classified as Other Services. When education is classified as Other Services in the LFS 2000:2 data and the value of compensation of employees for General Government and Other Services are derived and compared to those reported in the use table, there are huge discrepancies in the order of magnitude in the values. However, when Education is classified as part of General Government in the LFS 2000:2 the estimated compensation of employees for General Government as well as for Other Services is in line with that reported in the use table. It was therefore decided to classify Education as part of General Government instead of Other Services, as dictated by the LFS 2000:2 data rather than the reported SIC classifications. It was only after the finalisation of the input-output SAM that a satisfactory reason for this apparent inconsistency was obtained. It appears that public education is classified as General Government and private education is classified as Other Services (Bouwer, 2007). General Government should ideally only include activities of government departments, but the lack of accurate and detailed data prevents the separation of public education from General Government for purposes of compiling the SU-tables and GDP figures in P0441 (SSA, 2004), which are used as control totals for the SU-tables.

The implications for the input-output SAM are the following:
- The new Education activity should be interpreted as representing only public education, because the account for Other Services still includes private education, as the account for Other Services were not affected by the disaggregation process.
- The total output by the public Education activity is overestimated, as it was regarded as total education when it was disaggregated from the General Government activity. The new Other Government activity is therefore now underestimated, because aggregation (simple summation) of Education and Other Government will return the original General Government account.
- The overestimate of public Education also stems from the fact that the (over)estimates of compensation of employees per labour group from LFS 2000:2 data that were used in the disaggregation of the account were deemed to be the most reliable data on which to base the disaggregation.

- The estimates of compensation of employees per labour group from LFS 2000:2 data that were used in the disaggregation of the Education account reflect compensation patterns of combined public and private education. The compensation patterns of Other Government Services are therefore perturbed.
- Household consumption of Education includes consumption of both public and private consumption.

The conclusion drawn from this process of disaggregation is that the lack of detailed and accurate data on government services poses immense challenges for detailed analysis of government and social services. The lack of detailed documentation about what really is recorded (as opposed to what should be recorded) in the accounts of the SU-tables compounds the problems that arise when such detailed analysis is attempted. For purposes of this study the disaggregation of the service accounts was not achieved satisfactorily within the time frames available. However, the process has highlighted issues that have not been explicit before and therein lies its contribution. If the Education and Other Government is aggregated back to the original joint account of General Government and the Health Care and Social Care accounts are aggregated back to a single account for Health and Social Work, the input-output SAM can provide a base for future studies that attempt the disaggregation of the government and social service sectors.

8.   Estimation of a balanced SAM using Cross Entropy

8.1.   Theoretical overview of the Cross Entropy SAM estimation method

As described, the process of compiling the prior SAM results in a matrix of priors for transactions values in the national SAM, but the SAM does not meet the necessary accounting constraints of a SAM, e.g. that each account must balance, that is receipts and expenditures must equal. This is a common problem in SAM database building, and a specialised field and varying techniques exists to transform the unbalanced priors into a balanced SAM that can be used for modelling. Due to the size and complexity of the problem and the nature of the available data, it was decided not to make use of either *ad hoc* adjustments to the data or a mechanical bi-proportional balancing method commonly used called RAS. Specifically, the prior data are:
- at differing levels of quality;
- at differing levels of aggregation;
- at differing orders of magnitude numerically (very large and very small transactions mixed).

Hence, it was recognised that a more flexible approach is required. One such approach, fairly novel in the field, derives from information-theoretic literature, making use of an

information metric termed *entropy* to numerically estimate the best fitting SAM given the prior data and the necessary constraints. Building on existing work[21], substantial development of a method that can be applied to a SAM such as the present one has been done by the PROVIDE project. Specifically, the method takes into account the computational complexity of the problem, the need for sensible data organisation (with explicit recognition of the fact that source data are at different levels of aggregation) and the need to apply the method in a way that is consistent and compatible with the underlying information theoretic principles.

8.1.1.   The Generalised Cross Entropy Method

Numerous methods exist to derive balanced SAM estimates from an unbalanced set of priors. In all of these, the objective is to determine a SAM that meets the necessary accounting constraints that is as close as possible to the prior data. Different methods differ because they measure the "distance" between the estimated and the prior data differently[22].

The generalised cross entropy method (GCE) (Golan, *et al*., 1996), which forms the basis of the method we use, explicitly assumes that we are trying to estimate some data for which we have measurements, but the measurements are subject to various kinds of (unspecified) measurement error. This is in fact an accurate reflection of the reality we face, where one can think of a theoretical SAM that *accurately* reflects all of the transactions in a given economic system over a specified period of time, which one wished to estimate, but the source data that are available reflects information about this SAM imperfectly, because of sampling errors, *e.g.* in survey data, estimation errors, *e.g.* in estimated macroeconomic data, mapping errors between datasets using alternative categorisations, time-period mismatches, non-recorded (missing) transactions, and various other statistical errors. The GCE method makes use not only of a prior for each magnitude being estimated, but also for characteristics of the measurement error generating process, so as to explain the existing measurements against the estimates. The estimation process then proceeds by estimating error distributions that can explain the measured values against the estimated "actual" values, which are implicitly determined in the process. A benefit of this method is that detailed prior information regarding the measurement process can be incorporated into the estimates, allowing the database builder not only to specify the magnitude in the SAM, but also influence how these are treated by the estimation procedure. Typically, this functionality is utilised to incorporate a measure of accuracy of the prior data in the process, so that better quality data are given

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[21] See e.g. Golan, Judge and Robinson (1994), Golan Judge and Miller (1996) (especially chapter 6), McDonald and Robinson (1998), Robinson and El-Said (2000), Robinson, Cattaneo and El-Said (2001) and McDonald and Robinson (2004). More references are provided in PROVIDE Technical Paper 2006:2.

[22] Not all methods explicitly measure the difference, but for those that do not, an equivalent method that does minimise a difference measure always exists. For example, the common RAS method's implicit difference measure has been shown to be equivalent to a specific formulation that is based on cross entropy.

more weight than lower quality data. Subject to the assumption of independent measurement, any number of additional priors can be added to the problem, and these can relate to other magnitudes in the system in arbitrary ways. This functionality is used to add prior information about row and column totals and various "macro" aggregates, which should improve the accuracy of the estimation.

8.1.2. *Sequential disaggregation*

A semi-formalised method of top-down SAM estimation, and accompanying software for implementing it has been developed by the PROVIDE Project. A balanced NAM is used as a starting point, and the problem is divided into phases that each effect a degree of disaggregation. Each subsequent phase introduces additional prior data, which cannot affect any estimations from previous phases. While the top-down method is not usually regarded as ideal in the estimation of national accounting data, it was intentionally adopted for the estimation of the PROVIDE SAMs for a number of reasons:

- Gaps and areas of poor quality in the micro-level data constrain estimation of macro aggregates using a bottom-up method.
- The method provides a means to separate some prior data from others in the estimation process. This is useful because it can be used to "isolate" data believed to be of relatively low quality, and also to separate data that derives from common measurement processes, which may otherwise violate the assumption of independent measurement inherent in the cross entropy technique.
- As utilised, the top down sequential disaggregation method allows a large computational problem to be split into manageable smaller parts.
- The method delivers a SAM that is consistent with existing data at national accounting level. Though this does not necessarily constitute a model for optimal accuracy[23], it has the distinct advantage that results based on the SAMs are more comparable to other published work, and hence more acceptable generally.

Ultimately this amounts to a decision to "trust" the macro data from the South African Reserve Bank (SARB), which are used as the basis for our estimation and are also (amongst others) used by Statistics South Africa for benchmarking their own data[24]. This is not ideal, since the process by which the SARB data is estimated remains unpublished and unknown, but it is the only feasible outcome given the quality and extent of publicly available data

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[23] Note however that the 'accuracy' of economic analyses based on SAM data depends fundamentally upon the extent to which the SAM captures economic interdependence. This is represented by the relative magnitudes of the entries in the columns of the SAM not the absolute magnitudes of transactions (see Pyatt, 1988).

[24] While Statistics South Africa uses SARB data to provide 'control' totals they also include balancing items for each account in the supply and use tables; these balancing items indicate the extent to which the Statistics South Africa and SARB data diverge.

sources, also taking into consideration available resources, which precludes gathering primary data.

The sequential disaggregation approach starts by delineating the structure of a "system of SAMs", which is the basic "bottom-level" SAM that we wish to estimate along with a number of aggregations of it, and mappings between the accounts of these SAMs. This data structure is used during the estimation process as a basis for sequential disaggregation, but at the same time it provides a useful means of organising prior data at differing levels of aggregation. At the same time, the *phases* into which the process is to be split are also specified, each consisting of two SAMs that are two adjacent steps in the series of defined SAMs, a "macro" and a "micro" SAM at each level. Following the definitions is a process of configuration, which involves specifying how the prior data is to be entered into the structure, and then specifying the model's constraints (e.g. balancing constraints), *targets* and their characteristics. A target is a generalised unit of prior data to be reflected as part of the problem's objective function, the entropy divergence function. When configuration is complete the program can be invoked to solve the constrained maximisation problems set up in each phase. Following successful completion, a balanced SAM will have been produced along with a plethora of additional information about the estimation process that can help to evaluate the resultant SAM.

8.2. Implementing the Cross Entropy Method for the SAM

8.2.1. Prior Data

The prior data to be used in the estimation of the SAM consists of:
- a 25 account NAM derived using SARB data;
- partial supply-use data at 9-sector level that are consistent with the NAM; and
- the main 317 account national SAM[25].

While the first two sets of data are mutually consistent, the detailed SAM is not fully consistent with them primarily because of the adjustments made in terms of crude oil usage. Aggregated data from the detailed SAM is used to "flesh out" the 9 sector data into a full (but unbalanced) SAM (see next subsection).

8.2.2. SAM and phase configuration

This subsection describes the structure of the SAMs and phases in their relation to the "system of SAMs" data structure used by the estimation process. The final/bottom-level SAM in the system is the full supply and use SAM. At the top of the system is the 16 account

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[25] Balancing is carried out before the aggregation of the commodity and activity accounts.

NAM, followed by an expanded version of this NAM based on 9 sectors in the next phase (32 accounts). Following this, an intermediate 224 account SAM is estimated followed in the last phase by the final 317 account SAM. Sequential disaggregation is used in the last two phases: the 224 account SAM and the 317 account SAM are constrained to be fully consistent with each other and with the 32 account 9 sector SAM[26]. A summary is given in Table 19 and a complete listing of mappings that involve disaggregation is given in Table 47 in the appendix.

Table 19:   Phase and SAM configuration for estimation of the PROVIDE SAM

Phase	Macro SAM	Micro SAM	Macro Constraints	Description
Phase1	16 Account NAM	32 Account 9 Sector SAM	Std Error 2% of priors	Estimates a 9 sector SAM using a combination of data from the 9 sector SU data and aggregated data from 317 account detailed prior SAM as the micro SAM, and the 16 account NAM as the macro SAM.
Phase2	32 Account 9 Sector SAM	224 Account SAM	No Error	Estimates a SAM with 97 activities, 97 commodities, 9 labour factors (split by province), 1 capital factor, 1 land factor and 9 households (split by race and urban/rural/ex-homelands).
Phase3	224 Account SAM	317 Account SAM	No Error	Disaggregates labour factors and households fully, arriving at the final full SAM.

8.2.3.   Compiling the prior database

The phase configuration above defines relationships between macro and micro SAMs for each phase. This subsection describes the process of entering the available prior data into the data structure used by the model framework.

A central feature of the application framework that has been developed is a database of priors organised as a single square matrix, called the master multi-SAM database, or MasterSAM for short. MasterSAM is used for both prior and posterior data and it is used for both micro SAM and macro SAMs from all phases. At the same time, it is fairly small: The whole system is a 367 x 367 matrix. This is made possible by sharing accounts between SAMs.

The database is constructed by entering prior values for all of the SAMs in all of the phases – in reverse order, beginning with the micro SAM of the final phase, which is of course the full 317 account SAM. The intermediate SAMs are simply aggregations of the 317 account SAM. Missing values of the 9-sector SAM for the first phase are derived similarly. Upon execution, after each phase, the solved micro SAM is replaced into the master multi-SAM database, so that subsequent phases can read priors from it. We have also implemented

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[26] They are also consistent with the 16 account NAM, barring insignificant unexplained differences (which is why small error are allowed in the first phase).

a procedure that scales sub-matrices of the micro SAM priors so that the priors satisfy the macro constraints.

8.2.4.   Configuration of targets

This subsection describes the process of configuration of the SAM estimation procedure within the estimation framework that has been developed, using the given prior data in the MasterSAM data structure. The first part of the configuration is fairly trivial, namely to specify the SAM constraints that each account in each phase must balance after the solution. The remainder of the configuration involves specifying how *targets* are to be treated.

Targets are generally values directly from the SAM or derivatives from it, such as aggregates or ratios. Targets are categorised as micro (cell values for micro SAM), macro (cell values for macro SAM) and ratio targets (ratios between cell values and/or aggregates in the micro SAM – see below) in each phase. Targets are used as the basis for selecting both *constraints*, representing measurements without error, and elements to be included in the objective function for the constrained optimisation problem of each phase, representing measurements with error. Targets can also be left "not implemented", in which case they are effectively ignored during estimation (but are still useful for reporting purposes). The estimation problem is then to estimate a SAM that is consistent with all the constraints while minimising the cross entropy divergence between the estimated values and priors for each "target with error".

Configuration amounts to specification of whether and how "targets" are to be implemented. For targets with error, characteristics such as the standard error coefficient must be configured, which is essentially a measure of the quality of the data – better quality data having smaller coefficients[27]. This measure is itself a subjective prior. Our approach is to use a default value for a given context, coupled with higher or lower values where the quality of the data is judged to be worse or better than average. Following the sequential disaggregation approach, where we wish to force a micro SAM to conform exactly to a pre-existing macro SAM in a particular phase, the macro targets would be implemented without error and the micro targets with error.

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[27] The framework makes use of a symmetric normal-like, discrete, three-term error distribution, although others can also be configured. In addition to the standard error coefficient, in the framework it is also necessary to establish whether to use additive or multiplicative errors. Additive errors are in the form $\hat{X} = \bar{X} + E(\bar{e}_X)$, which means that the estimated value is the prior value plus (by convention, technically it should be subtracted) the expected measurement error, while multiplicative errors are in the form $\hat{X} = \bar{X}.\exp(E(\bar{e}_X))$. For the PROVIDE SAM, additive errors were used exclusively due to computational considerations, except for the ratio targets, which were implemented with multiplicative errors. See PROVIDE Technical Paper 2006:2 (PROVIDE, 2006) for details.

The remainder of this subsection details the rules used to set error coefficient priors. Error coefficients represent the standard deviation of the error distribution from which the measurement errors are considered to be drawn, as a per centage of the prior's magnitude. For example, for a prior value of 10, an error coefficient of 0.2 means that the error distribution prior is a normal-like distribution with a mean of zero and a standard deviation of 2. Most rules for assigning error coefficients refer to blocks of cells in macro or micro SAMs of *all* phases simultaneously. Not all rules are necessarily applicable to all phases, for example rules referring to an account that does not appear in a given phase will not affect that phase. Rules are applied in the order listed, so that later rules take precedence when two or more rules refer to the same target in the same phase. Rules are enumerated below for convenience; the numbers have no further significance.

Micro targets

Rule 1:   The default error coefficient is 0.25. This includes all cells, including row and column totals, of the micro SAMs in each phase. These values are in many cases overwritten by more specific rules below.

Rule 2:   The "total-of-totals" cell, i.e. where the row and column account totals accounts overlap, is de-implemented (effectively removed from the relevant objective functions).

Rule 3:   The error coefficients are adjusted upwards to 0.45 (signifying data of lower quality) for payments from labour factors to the rest of the world account. The priors are considered to be of low reliability because many of these transactions may not be captured accurately.

Rule 4:   The error coefficients are adjusted upwards to 0.35 (signifying data of lower quality) for the following:
- Payments from land to households (land income distribution);
- Payments from land to enterprises (land income distribution);
- Inter-household transfers;
- Payments from households to the rest of the world (transfers to foreigners).

Rule 5:   The error coefficients are adjusted upwards to 0.45 (signifying data of lower quality) for payments from the rest of the world account to labour factors and to households.

Rule 6:   The error coefficients are adjusted downwards to 0.15 (signifying data of higher quality) for the following, but only in micro-level priors from phase 2 onwards. Payments from the capital factor account (GOS) to:

- Enterprises (income distribution);
- Savings;
- The rest of the world account (foreign factor payments).

Rule 7:   The error coefficients are adjusted downwards to 0.15 (signifying data of higher quality) for the following:

- Payment from enterprises to enterprises, a residual total representing aggregated inter-enterprise transfers.
- Payments from enterprises to DDIRTAX (direct taxes), GGOVT (transfers to government), DDSTOC (stock changes), KKAP (savings) in the micro-level data only.
- Payments from enterprises to the rest of the world account.
- Payments to the general government account by the tax accounts IINDTAX (production taxes) and DDIRTAX (direct taxes) in the micro-level data only. These payments reflect the transfer of the balances from the tax accounts to the general government account.
- Payments from the general government account to commodities (consumption), enterprises (transfers), savings and the rest of the world account (transfers to foreigners).
- Payments from the rest of the world account to capital factors (foreign factor income).
- Transfers from foreigners to government.
- Foreign savings.

Rule 8:   Error coefficients for a selected number of cells involving crude oil usage are adjusted downwards to 0.05. In this case, the adjustment is made to prevent the corrections made to the prior data (see section 7.2.2) from being undone by the cross entropy procedure. This rule does not affect macro-level data at the 1 or 9 sector level. The specific cells are:

- (A4, C4a), usage of crude oil by the petroleum products activity;
- (RROW, C4a), imports of crude oil;
- (RROW, C4b), imports of "other mining" commodities excluding crude oil.

Rule 9:   Error coefficients for payments from activities to factor accounts are adjusted to 0.20 (signifying data of higher quality).

Rule 10:   Error coefficients on all cells in the domestic services activity (A95) row and commodity (C96) column are increased to 0.35. This is due to the fairly large imbalance on the A95 account. As the total for A95 is also reflected in the C96 account (and constrained to be the same), this value is also loosened to make the increase on A95 effective.

Rule 11: De-implement all row total targets, but leave column total targets implemented. This reflects a belief that the payments structure for accounts is better represented in the data than the receipts structure.

Rule 12: For activity accounts, re-implement row total targets but de-implement column total targets. This reflects a belief that that for activity accounts, the receipts structure is better reflected, which in this case amounts to production / supply data.

Rule 13: Any micro target of zero is implemented as without error, i.e. as a hard constraint. This reflects the fact that zeroes indicate the non-existence of a particular transaction rather than a missing value (which are not catered for at this stage)[28].

Macro targets

Rule 14: By default, all macro targets are implemented with no error. This is the basis of the sequential disaggregation approach and will deliver an estimated SAM that is fully consistent with the macro SAM. However, the estimation will fail if the starting macro SAM is not balanced.

Rule 15: All macro targets in phase 1 are implemented with error, and an error coefficient of 0.02. This reflects the fact that there are some very small discrepancies between the NAM and the 9 sector data used to construct the 9 sector SAM. This rule partially overrides Rule 14.

Rule 16: The "total-of-totals" cell, i.e. where the two row and column total accounts overlap, is de-implemented.

Rule 17: The following cells are de-implemented at the macro-level data, allowing them to move freely without penalty to the objective function. This rule affects the first two phases only.

- (HALL, HALL), inter-household transfers. The aggregate has no meaning in the macro SAMs except to allow account totals to be consistent with corresponding micro-level account totals.
- (CALL, DSALL), stock changes per commodity. This is used as a balancing item.

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[28] In actual fact, this is merely an optimisation, since implementing an error distribution with zero standard deviation (a nonzero coefficient multiplied by zero) would not allow any deviation between the prior and estimated value in any case.

- (SALL, DSALL), the total balance of stock changes being transferred to the savings account. Changes in this value mirrors changes in the individual changes allowed by the previous item.
- (IMALL, IMALL), an otherwise meaningless cell which is used to record the trade balance. Since this figure is not important in the SAM, it is allowed to float freely.

Rule 18:   The error coefficients are adjusted upwards to 0.20 (signifying data of lower quality) for macro targets involving trade and transport margins, since these do not derive from the NAM. The rule only affects the first phase. The affected cells are:

- (CALL, MALL), the aggregate for all margin usage.
- (MALL, CALL), the mirror item of the above.
- (TTOTAL, MALL), the column total, which again simply reflects the total margin usage.

Rule 19:   All row total targets are de-implemented, leaving column total targets implemented.

Rule 20:   All targets with a zero value are de-implemented. While this could be used to let missing values – with corresponding entries in the micro SAM – be handled gracefully, there are no such cases in the PROVIDE prior data[29]. Instead, this merely removes superfluous targets, since the corresponding micro targets will be constrained to zero in any case.

Ratio targets (factor payment shares)

Ratio targets are implemented differently. Instead of setting up each target by reference to a cell or block of cells in the micro or macro SAMs, ratio targets are set up by reference to a ratio definition, which may include numerous individual targets, all of which share the same settings (e.g. error coefficients). A ratio definition includes a name, a domain (the accounts over which the targets are defined), a specification of the numerator(s) and a specification of the denominator. The individual targets are then either each cell of each account's numerator to the account's denominator (multiple targets per account), or the sum of all the cells in the numerator to the denominator (single target per account). These are designated type 1 and type 2 ratio targets respectively.

A single type 1 ratio definition has been implemented for the current SAM, for factor payment shares in each activity. The domain is the activity accounts, the numerators in each activity account are the factors (in the columns on the activity accounts) and the denominator

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[29] It was found that checking for such cases is a very useful way to verify that the configuration (especially mappings) is correct.

in each activity is the sum of all such payments by the activity. This defines a total of 2754 targets across the three phases (after zero-valued targets are excluded), of which 19 are in phase 1, 97 in phase 2 and 2638 in phase 3. Only phase 2 and phase 3 targets were implemented. Ratio targets were configured with multiplicative errors and an error coefficient of 0.3.

8.2.5.   Execution

Execution proceeds in two steps. During initialisation, the above rules are used to construct a series of tables containing settings for each cell of each micro and macro SAM in each phase. The main program is then run, which builds a constrained optimisation problem for each phase, and solves these in succession. Prior to each phase, an option to scale sub-matrices in the micro SAM to equal the corresponding macro SAM target is invoked, following the top down method as discussed. The MasterSAM data structure is instrumental: it is used to read values for targets when each phase is set up, and after solving the results are written back to it. A copy of the MasterSAM as well as additional diagnostic information is held after each phase, for reporting purposes.

The main program runs all phases automatically in succession. The current version of the configuration takes about one hour to complete on a Pentium M 1.87Ghz computer for all of phases (although the speed often varies substantially after minor configuration changes; typical execution times are up to 4 hours). The fast execution time for a SAM of this magnitude is largely due to the computational simplification introduced as a result of the sequential disaggregation approach and associated optimisations. The generated constrained optimisation problem for the final phase has 40 983 equations and 62 173 variables, from 18 688 implemented individual targets with error.

8.3.   Evaluating the resulting SAM

The logic of the method was validated in the sense that a fully balanced SAM has been produced, which is fully consistent with the NAM, the 9 sector expansion thereof and the intermediate 224 account SAM. However, the ultimately goal is to have a SAM that accurately reflects known economic relationships in the entire economy, both at macro and at micro level. There is therefore a need to evaluate the quality of the resultant SAM in economic terms. If the SAM is found to be inconsistent with available economic information, there are grounds for amendment of the priors or the method.

There is little clear guidance on how a systematic SAM evaluation could be done, given that differences between prior and posterior outcomes in themselves are not necessarily indications that that the resultant SAM is inaccurate, merely that the prior information

contains inconsistencies. Nevertheless, it is useful to use such differences as a starting point for judgemental analysis. Such an evaluation is made difficult by the vast amount of economic information embodied in the SAM.

A reporting system that was developed as part of the evaluation process reports on each configured target. Each target is evaluated against the prior value for the phase, and it is possible to identify areas where the solution SAM differs appreciably from the prior values. During development of the SAM, this system has been used to identify problematic areas in the data and configuration and to make adjustments where necessary. The introduction of ratio targets for this SAM was particularly successful in preserving the economic information inherent in the factor payment shares in the prior data. The final results suggest that an acceptable SAM has been produced, as large adjustments are only found in accounts with large imbalances or in data known to be of poor quality (and appropriately configured). Moreover, the SAM appears to accord with known economic relationships, especially at an aggregate level.

9.   REFORMULATION OF SAM

9.1.   Data configuration

An EPWP activity and an EPWP factors (EPWP unskilled male and female) account were added to original South Africa SAM 2000 (SAM). The following assumptions were made for the purpose:

(1) The sector does not have any leakages, such as taxes, capital accumulation, or trade.

(2) The sector does not hire economy-wide unskilled labor. It hires only EPWP unskilled labor that comes from poor and ultra poor households. However, skilled labor comes from economy-wide skilled labor market.

(3) All the households spend their salary from EPWP on buying EPWP goods. This assumption is necessary to keep the original household expenditure data intact and to balance the SAM with minimal manipulation.

(4) Intermediate input use from other activities by EPWP matches the amount of EPWP output used as intermediate inputs by other activities. This assumption keeps the original input-output (I-O) matrix as it is. Given the lack of I-O data with integrated EPWP sector, this assumption ensures that our analysis is not based on any arbitrary guesswork involving illegitimate modification of the original I-O.

The data for EPWP addition mainly comes from "Volume 4: Cost Benefit models: Broadening the EPWP" by Irwin Friedman (CBM). Re-organizing data to fit the structure of SAM requires several further assumptions:

1. All the titles from the source are re-grouped based on assigned roles and responsibilities to activities in the SAM whose nature resembles them.

Table 20 Titles and matching activities

titles	matching activity
school nutrition workers	domestic services
sports coaching facilitators	education
school caretakers	build. Constr./other services
adult education workers	education
special school teaching aide	education
school clerical workers	government services
peer educators	education
social security workers	social care
food security workers	government services
VCT counsellors	health care
community health facilitators	health care
community health workers	health care
communicy caregivers	health care
TB & DOTS supporters	health care
Treatment supporters	health care
Malaria workers	health care

2. To disaggregate by **skill** level, all trainees are assigned to unskilled, and all mentors, supervisors, and staff are assigned to skilled labor.

3. To disaggregate by **gender**, the gender ratio of the matching activities from the SAM was used. For instance, salary for school nutrition workers (trainees), 631 million rand, is split between male and female by 17 vs. 83 percent gender ratio from unskilled labor in domestic services activity.

4. Travel expenditure enters as an EPWP transportation and communications intermediate input.

5. The expenditure on food, material, and equipment (i.e. intermediate inputs) is allocated across activities using adjusted average expenditure propensies of the matching activities from the SAM. The adjustment is made only to endogenous accounts. This is based on the assumption that EPWP sector does not have any leakages. These are subsequently aggregated back to the EPWP account.

6. Training pay, (R25 per day for 60 days per year) goes to male and female unskilled labor (trainees) based on an aggregated gender ratio of the two.

7. Administration costs are allocated based on the average expenditure propensity of government services from the SAM

8. Compilation of the data generates a base for integration into SAM, as well as for construction of a shock to the economy.

9.2.   <u>Integration into SAM</u>

9.2.1.   I. EPWP activity column(s)

1. The average expenditure propensity of EPWP comes from the reorganized data.

2. The annual expenditure on social sector EPWP (20.8 million South African rand in 2004) is deflated to year 2000 level (16.8 million rand), using a consumer price index annual average (base year 2000=100) from World Economic Outlook by IMF (source: the South African Reserve Bank). → *This was the original proposed amount. Now, we use 0.1 (million) rand, an arbitrary value, to minimize modification to the original SAM.*

3. Applying the EPWP propensity to the aforementioned annual expenditure generates absolute input costs of EPWP sector.

9.2.2.   II. EPWP activity row(s)

1. A part of EPWP revenue comes from household consumption of EPWP goods. The household expenditure on EPWP output is assumed to be equal to the household salary from EPWP.

2. EPWP salary to poor and ultra poor households goes to EPWP goods consumption strictly.

3. We assumed that the rest of EPWP output, not consumed by households, is used as inputs for each industry that EPWP buys input from by the equal amount. This symmetry of input-output between EPWP and all other activities minimize further modification of the original SAM.

9.2.3.   III. EPWP factor columns

1. EPWP unskilled male and female labor force (originally trainees under EPWP program) comprises EPWP factor account.

2. They are from poor and ultra poor household types across geography and race.

3. Distribution of EPWP unskilled male and female jobs occur among poor and ultra poor households. The allocation is based on the shares of number of households, unemployment rate, and depth of poverty by household type.

Table 21 Distribution of EPWP Unskilled Jobs among Poor and Ultra poor households

HH type	%
Urban Formal African Poor	3.5%
Urban Formal African Ultra Poor	16.3%
Urban Formal Colored Poor	0.5%
Urban Formal Colored Ultra Poor	1.8%
Urban Informal African Poor	2.5%
Urban Informal African Ultra Poor	6.8%
Rural Commercial African Poor	2.6%
Rural Commercial African Ultra Poor	13.8%
Rural Commercial Colored Poor	0.1%
Rural Commercial Colored Ultra Poor	0.3%
Ex-homeland African Poor	8.5%
Ex-homeland African Ultra Poor	43.3%
Sum	100%

4. Allocation of EPWP skilled jobs follow the existing distribution of skilled jobs illustrated in the original SAM, and thus does not need a separate column account in the matrix.

9.2.4. *IV. EPWP factor row*

1. EPWP factor (male and female) receives salary from EPWP sector.

9.2.5. *V. Household row*

1. Household incomes from factors are based on original SAM with extra income from EPWP sector. The salary of **skilled** labor in EPWP is distributed based on the adjusted households' shares of skilled labor (factor → household accounts). The new shares are computed without including the rest of world accounts for each factor. This is consistent with assumption (3). See row 70-89 columns I and K: (or row 62-63) in tab EPWPinput% of SAM.xls for the share. For example, out of 1 rand for skilled male in EPWP, non-poor urban formal African household receives 1*0.27 (HH share of the skilled-male labor) rand.

2. The salary of unskilled labor does not change from the original data. Instead, EPWP salary for EPWP unskilled labor enters EPWP factor accounts. See the section on EPWP factor columns.

3. All other accounts on household rows remain the same.

9.2.6. *VI. Household column*

1. Household expenditure composition on all other goods does not change. As mentioned in EPWP row section, all income from EPWP is spent on EPWP goods for each household type.

9.3.   Construction of Interventions (shock files) - EPWP social sector and other scenarios

Data for EPWP social sector intervention come from three sources: "Cost and benefit models: broadening the EPWP" by Irwin Friedman (CBM), "Gender Analysis of the Working for Water Program: A Case Study of the Tsitsikamma Working for Water Project" by Mastoera Sadan, and Social Accounting Matrix (SAM) by the Provincial Decision-making Enabling Project (PROVIDE). To create an intervention, first, we need to know input composition of the sector.

CBM contains data that evaluates expansion of EPWP social sector in terms of job creation. The social sector broadly includes education and health sectors. The original classification of jobs needed to be organized to match with industry classification in the SAM for analysis. The matching is based on the description of job responsibilities of titles and the nature of activities from the SAM. See **Table 20** for the list:

The workforce for each title consists of trainees, mentors, supervisors, and staff with different skill requirements and wage rates. Wage information for trainees, mentors, supervisors, and staff from CBM is disaggregated to by skill (unskilled/skilled) and gender (male/female) categories to meet the factor structure in the SAM. All trainees are treated as unskilled and all other positions as skilled labor. Then, gender disaggregation takes place based on gender composition of matching activities from the SAM.

The expenditure on food, material, and equipment (i.e. intermediate inputs) is allocated across activities using adjusted average expenditure propensities of the matching activities from the SAM. The adjustment is made only to endogenous accounts. This is based on the assumption that EPWP sector does not have any leakages. These are subsequently aggregated back to the EPWP account.

The original CBM calls for 12.2 billion Rand in year 2004 price level. Deflation is required to match the value with the base year 2000 for SAM. Gross Domestic Product (GDP) deflator comes from "World Economic Outlook Database, October 2007" by International Monetary Fund[30]. Table 22 shows a brief input composition for EPWP social sector intervention.

Table 22 EPWP Social sector intervention[31]

Input	EPWP Social sector	Expenditure (million Rand)
Male skilled	2%	180
Female skilled	3%	296
EPWP Male unskilled	13%	1248
EPWP Female unskilled	19%	1733
Agriculture	10%	974
Food	31%	2910
Other inputs	21%	1953
Total	100%	9294

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[30] The GDP deflator (100 in year 2000) indicates that the general price level in year 2004 is 131.682. Thus, the deflation rate is $100/131.682 = 0.759$. The interpretation is following: one rand in year 2004 is equivalent to 0.759 rand in year 2000.

[31] 12.2 billion Rand in year 2004 is equivalent to 9.294 billion Rand in year 2000. ($12.2 * 0.759 = 9.294$)

9.4. No ag & food – modified EPWP social sector intervention

In the original EPWP social sector intervention, the expenditure on agricultural goods and food comprise 41% of total expenditure. Unless the intervention is mainly designed for distribution of food aid, this degree of funds devoted to food distracts from the focus of our intervention; thus, a modified social sector intervention does not include expenditure on those items. Instead, the amount is redistributed to scale up the expenditure on all other inputs. After deducting the amount for ag. goods and food from the original intervention, we calculated a new input composition and multiplied it by total expenditure 12.2 billion Rand to compute for input expenditure. Notice that salary for EPWP unskilled workers takes 55 percent of total expenditure, as opposed to 32 percent in the original intervention.

Table 23 Modified EPWP social sector intervention (1)

Input	Social sector w/o ag & food	Expenditure (million Rand)
Male skilled	3%	309
Female skilled	5%	509
EPWP Male unskilled	23%	2143
EPWP Female unskilled	32%	2978
Agriculture	0%	0
Food	0%	0
Other inputs	36%	3355
Total	100%	9294

9.5. Double 60:40

This intervention distributes 60 percent of total expenditure on EPWP unskilled labor, of which 60 percent goes to female workers. In the end, EPWP unskilled male and female workers receive 24 percent (60% multiplied by 40%) and 36 percent (60% multiplied by 60%) of total expenditure, respectively. The remaining 40 percent is used to purchase all other inputs, including skilled male and female labor. This allocation increases EPWP unskilled salary slightly higher than the previous intervention, but lowers the expenditure on other inputs by 4 percent.

Table 24 Modified EPWP social sector intervention (2)

Input	Social sector Double 60 40	Expenditure (Million Rand)
Male skilled	3%	275
Female skilled	5%	454
EPWP Male unskilled	24%	2230
EPWP Female unskilled	36%	3346
Agriculture	0%	0
Food	0%	0
Other inputs	32%	2989
Total	100%	9294

9.6.   Working for Water (WfW)

The data comes from Tsitsikamma Working for Water program 2004/05. The objective of program is to eradicate invasive alien plant species in order to increase water supply. In so doing, labor-intensive nature of the work generates job opportunities to unskilled labor force in rural South Africa. The survey of the project reveals that different wage rates were applied to different responsibilities (see table 26).

Table 25 Working for Water - daily wage and gender composition

Title	Daily wage	Men	Women
Contractor	120	3	3
Foreman	60	2	1
Chain saw	50	3	0
Herbicide applicator	40	1	8
Brush cutter	35	2	0
Laborer	35	3	10

Source: Tsitsikamma Working For Water program 2004/05.

The first two columns describe job responsibilities and daily wages in Rand. The last two columns show number of men and women in each title. Contractor, foreman, and chain-saw operators are considered skilled labor, given the higher daily wages for the job. The other three titles, herbicide applicator, brush cutter, and laborer are assigned to unskilled labor.

Table 26 Gender-Skill decomposition

Gender	Male		Female	
Skill	unskilled	skilled	unskilled	skilled
# of people	6	8	18	4
%	17%	22%	50%	11%
wage (annual)	137,077	359,137	424,073	233,506
%	12%	31%	37%	20%
wage (adjusted)	137,077	422,361	541,172	297,984
%	10%	30%	39%	21%

As shown in the table 27, women take 61 percent of total workforce and form 75 percent of unskilled, low wage job category. However, they receive only 57 percent of total wage payment. To raise this gender inequality, the report suggests 60 percent of total wage payment, rather than 60 percent of jobs, should be allocated to women. The simulation thus follows the suggestion.

The original budget for the project in 2004-05 is following:

Tsitsikamma working for water program 2004/05 (unit: Rand)

Basic salary	244,800
Admin costs	636,188
Inventory	27,636

Equipment	21,684
Building (rental)	1,500
Professional service	1,238,246
Running costs	2,000
Equipment maintenance (management)	43,850
Equipment maintenance (contractors)	38,602
Service providers	373,039
Contracts (labor)	702,986
Contractors and workers (training days pay)	77,769
Total	**2,170,054**

The basic salary covers wage payment for staff of six that includes a project manager. The wage payments to workers other than staff include service providers, contracts (labor), and contractors and workers' training days pay. Then, based on the gender-skill ratio shown in table 27, the sum of all wage payments is distributed.

Total expenditure on Working for Water project is scaled up to 9,294 million Rand to be compatible with other simulations.

Table 27 Working for Water intervention

Input	Working for Water	Expenditure (million Rand)
Male skilled	19%	1809
Female skilled	14%	1276
EPWP Male unskilled	6%	587
EPWP Female unskilled	25%	2318
Agriculture	0%	0
Food	0%	0
Other inputs	35%	3274
Total	100%	9294

Table 28 Detailed input compositions

	EPWP (%)	mill. Rand	No ag & food (%)	mill. Rand	Double 60 40 (%)	mill. Rand	Working for Water (%)	mill. Rand
Male Skilled	1.9%	180	3.3%	309	3.0%	275	19.5%	1809
Female Skilled	3.2%	296	5.5%	509	4.9%	454	13.7%	1276
EPWP Male	13.4%	1248	23.1%	2143	24.0%	2230	6.3%	587
EPWP Female	18.6%	1733	32.0%	2978	36.0%	3346	24.9%	2318
Agriculture	10.5%	974	0.0%	0	0.0%	0	0.1%	12
Mining	0.1%	9	0.2%	16	0.2%	14	0.1%	14
Food	31.3%	2910	0.0%	0	0.0%	0	0.2%	17
Textile	0.4%	40	0.7%	68	0.7%	60	0.6%	58
Paper	0.5%	42	0.8%	72	0.7%	64	0.7%	61
Petroleum	0.4%	37	0.7%	63	0.6%	56	0.6%	53

Nonmetal	2.3%	215	4.0%	370	3.5%	330	3.0%	275
Metal	0.2%	21	0.4%	37	0.3%	33	0.2%	23
Machinery	0.7%	65	1.2%	111	1.1%	99	1.1%	100
Comm.Equip.	1.1%	102	1.9%	175	1.7%	156	1.6%	147
Transp.Equip.	2.5%	236	4.4%	406	3.9%	362	5.0%	462
Other Mfg.	0.5%	43	0.8%	74	0.7%	65	1.5%	142
Electricity	0.1%	13	0.2%	23	0.2%	21	0.2%	19
Water	0.1%	7	0.1%	12	0.1%	11	0.1%	11
Building	0.5%	42	0.8%	72	0.7%	65	0.3%	31
Construction	0.3%	31	0.6%	52	0.5%	47	0.4%	36
Trade, hotels, catering	0.4%	35	0.7%	61	0.6%	54	0.5%	46
Transp.& Comm.	3.0%	280	5.2%	480	4.6%	428	2.3%	213
Financial service	0.5%	44	0.8%	76	0.7%	68	0.8%	72
Business service	2.9%	272	5.0%	468	4.5%	417	8.1%	750
Education	0.2%	17	0.3%	29	0.3%	26	0.0%	0
Other Gov. service	3.8%	350	6.5%	601	5.8%	535	7.2%	672
Health	0.1%	8	0.1%	13	0.1%	12	0.1%	11
Social service	0.3%	32	0.6%	55	0.5%	49	0.7%	64
Other service	0.1%	11	0.2%	20	0.2%	17	0.2%	15
Total	100.0%	9,294	100.0%	9,294	100.0%	9,294	100.0%	9,294

10. Economic relationships in South Africa as reflected by the NAM, detailed input-output SAM and satellite accounts

10.1. Structure of the macro-economy of South Africa reflected by the NAM

The estimated NAM for South Africa is reported in Table 29. Gross domestic product at market prices was R920 681 million, with 49.7 per cent accruing to labour services, 41 per cent accruing to capital and the remaining 11.1 per cent accounted for by net taxes on products (R83 933 million) and production (R18 146 million).

Imports accounted for 9.5 per cent of total supply of R2 414 billion (measured at consumer prices), with the remaining 90.5 per cent of supply produced domestically. Total domestic production cost at basic prices of R2 099 billion, comprises payments to primary inputs (39 per cent), intermediate inputs (60.2 per cent) and production taxes (0.9 per cent).

The demand for commodities as intermediate inputs accounted for some 52.3 per cent of total demand for commodities; domestic final demand accounted for 37 per cent and exports for 10.6 per cent. Although South Africa was a net exporter of goods and services from the rest of the world in 2000 (R27 250 million), the total factor and institutional expenditures to the rest of the world (-R28 442 million) caused it to run a net deficit on the current account of R1 192 million.

Sources of household income were reasonably diversified. Income from labour services provided 63.1 per cent of household incomes, with the remainder coming from capital services, 13.6 per cent, inter household transfers, 2.8 per cent, payments from enterprises, 16.1 per cent, and transfers from government, 4.3 per cent. Expenditures were dominated by current consumption, 83.3 per cent, with direct taxes taking a further 12.6 per cent and savings being low at 1 per cent. Transfers to other households are 2.8 per cent of total household expenditure.

Total government income was R255 730 million, with 87.3 per cent from production, product and income taxes; 4.5 per cent from transfers from institutions and 0.2 per cent from the rest of the world. The government deficit of R20 527 million accounts for the remaining 8 per cent of government income. Total government expenditure comprised consumption expenditure (65.4 per cent), transfers to institutions (31.8 per cent) and rest of the world (2.7 per cent).

Gross domestic investment was R139 619 million (15.2 per cent of GDP), and this was complemented by a small increase in stocks, R7 096 million, giving total investments of R146 715 million. Domestic savings come from households, R6 922 million, and the allowance for depreciation, R119 200 million, with the savings out of enterprise income, amounting to R39 928 million.

Table 29: **A NAM for South Africa for 2000 (R million), based on the IO SAM[32]**

		1	3a	3b	4	5	6a	6b	7a	7b	8
		Commodities	**Factors**		**Households**	**Enterprises**	**Government**		**Capital**		**Rest of World**
			Capital	*Labour*			*Taxes*	*Expend*	*Investment*	*Stock changes*	
1	**Commodities**	1 263 557	0	0	578 958	0	383	167 374	139 619	7 096	257 015
	Factors										
3a	*Capital*	377 402	0	0	0	0	0	0	0	0	15 191
3b	*Labour*	440 816	0	0	0	0	0	0	0	0	2 242
4	**Households**	0	94 697	438 814	19 537	112 266	0	29 669	0	0	260
5	**Enterprises**	0	143 487	0	0	139 857	0	51 732	0	0	0
	Government										
6a	*Taxes*	102 462	0	0	87 828	33 257	0	0	0	0	0
6b	*Income*	0	0	0	1 870	9 688	223 164	0	20 527	0	481
	Capital										
7a	*Savings*	0	119 200	0	6 922	39 928	0	0	0	0	1 192
7b	*Stock changes*	0	0	0	0	0	0	0	7 096	0	0
8	**Rest of World**	229 764	35 209	4 244	128	80	0	6 955	0	0	27 251
9	**Totals**	2 414 002	392 593	443 058	695 242	335 075	223 548	255 730	167 242	7 096	303 632

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[32] As part of deriving the input-output SAM the activity accounts are 'removed' through apportionment and the new production accounts follow a commodity classification.

10.2. Patterns of demand from the input-output SAM

Table 30 shows for groups of commodities included in the SAM the share of the total value of demand of intermediate use, household consumption, government consumption, investment and stock changes, and exports. 41.3 per cent of demand for agricultural output is accounted for by household consumption, which is the highest for all sectors. Mining exports accounts for 57.8 per cent of the demand for mining products, while intermediate use is the most dominant demand for manufacturing (51.3 per cent), electricity (72.6 per cent) and water (60.2 per cent). 57.4 per cent of construction is demanded from investment. The share of demand accounted for by intermediate input use of business and financial services (72.5 per cent) is relatively high, compared to that of other services (education, government, health and social care) (17.3 per cent). This is because 54.3 per cent of demand for other services is accounted for by government consumption. In total, 52.4 per cent of demand is for intermediate use, 37.0% for domestic final consumption and 10.6 per cent for exports.

Table 30: **Components of total demand, by commodity (row per centages)**

	Intermediate use	Household consumption	Government	Investment and stock changes	Exports	Total
	%					(R million)
Agriculture	48.3	41.3	0.0	0.4	10.0	78 796
Mining	41.3	0.3	0.0	0.5	57.8	155 047
Manufacturing	51.3	27.6	0.0	8.8	12.3	1 007 282
Electricity	72.6	27.4	0.0	0.0	0.0	29 825
Water	60.2	39.8	0.0	0.0	0.0	11 121
Construction	35.2	7.3	0.0	57.4	0.1	91 108
Business and Financial Services	72.5	22.2	0.0	0.7	4.6	732 096
Other services	17.3	27.8	54.3	0.0	0.6	308 343
Total	52.4	24.0	6.9	6.1	10.6	2 413 619[1]

[1] Net production subsidies of R383 million reflected in the NAM in Table 29 are taken into account as a (negative) component of output in Table 31, hence the difference in total demand and supply compared to the NAM.

10.3. Patterns of production from the input-output SAM and satellite accounts

Table 31 shows for groups of commodities included in the SAM the share of the total value of output of payments to intermediates, gross operating surplus, labour, taxes and imports. Business and Financial Services is more capital intensive, with GOS comprising 24.4 per cent of total output and labour payments 22.1 per cent, compared to Other Services (GOS 10.0 per cent and labour 48.7 per cent).

Table 31: **Components of total output, by commodity (row per centages)**

	Intermediate use	GOS	Labour	Product taxes	Production taxes	Imports	Total output
	%						(R million)
Agriculture	43.5	31.5	19.4	1.9	-0.4	4.1	78 796
Mining	37.8	26.0	15.9	0.0	0.6	19.6	155 047
Manufacturing	64.3	8.1	6.4	5.5	0.2	15.7	1 007 282
Electricity	46.2	37.1	13.0	2.8	0.9	0.0	29 825
Water	71.1	12.9	14.1	2.7	-0.9	0.0	11 121
Construction	65.1	9.8	21.1	3.4	0.4	0.3	91 108
Business and Financial Services	45.1	24.4	22.1	1.9	1.7	4.8	732 096
Other services	36.4	10.0	48.7	3.1	0.8	1.0	308 343
Total	52.4	15.6	18.3	3.5	0.8	9.5	2 413 619

The distribution of payments to labour groups identified on the basis of gender and educational attainment is presented in Table 32. The Services industries are biased towards female labour, whereas the primary and secondary sectors are biased towards male labour.

Table 32: **Distribution of factor payments to factor group, by commodity (row per centages)**

	Male none to GET	Male matric	Male tertiary	Female none to GET	Female matric	Female tertiary	Total labour
	%						(R million)
Agriculture	41.8	22.9	13.8	15.5	2.9	3.0	15 326
Mining	56.9	19.8	20.0	0.8	1.3	1.1	24 721
Manufacturing	29.1	21.2	25.6	11.5	6.4	6.3	64 087
Electricity	23.9	23.3	40.7	1.4	7.0	3.8	3 873
Water	27.2	49.3	13.1	6.2	4.2	0.0	1 565
Construction buildings	54.1	24.7	14.9	2.0	2.9	1.4	12 590
Construction – roads	52.4	29.0	14.6	1.2	1.2	1.5	6 614
Business and Financial Services	19.9	18.7	31.5	9.7	11.3	8.8	161 743
Education	3.6	3.6	32.9	3.6	7.1	49.2	45 399
Other government services	13.0	19.8	30.7	3.8	10.9	21.8	67 253
Health care	5.8	3.0	23.8	16.5	16.9	34.0	11 829
Social care	22.2	9.2	2.2	20.6	11.2	34.6	1 830
Other services	25.3	16.4	21.3	15.1	8.9	13.1	13 298
Domestic services	15.2	1.9	0.1	75.7	6.2	0.9	10 689
Total	22.5	17.4	27.3	9.7	8.8	14.3	440 816

From the factor payments in the supply and use SAM and the satellite account for factor use by industry from the IES/LFS 2000 it is possible to calculate the average wage per factor group as presented in Figure 4. The results confirm that a) average wages are positively correlated to levels of education, b) males earn higher average wages than equally skilled female counterparts, and c) average wages for employees with matric or lower qualification earn the highest average wage in Western Cape and Northern Cape (West Coast) compared to

other regions, but employees with tertiary qualifications earn the highest average wage in the central provinces (Gauteng, North West and Free State), which includes the economic hubs of Gauteng province, compared to other regions. When comparing average wages on a national level between male and female employees from similar education groups, it was found that average wage for employees with education up to GET is 82 per cent higher for males than for their female counterparts, 51 per cent higher for males with matric than for females with matric, and 84 per cent higher for males with tertiary education than for females with tertiary education.

Figure 4 Average wages of factor groups, by region (Rand per annum)
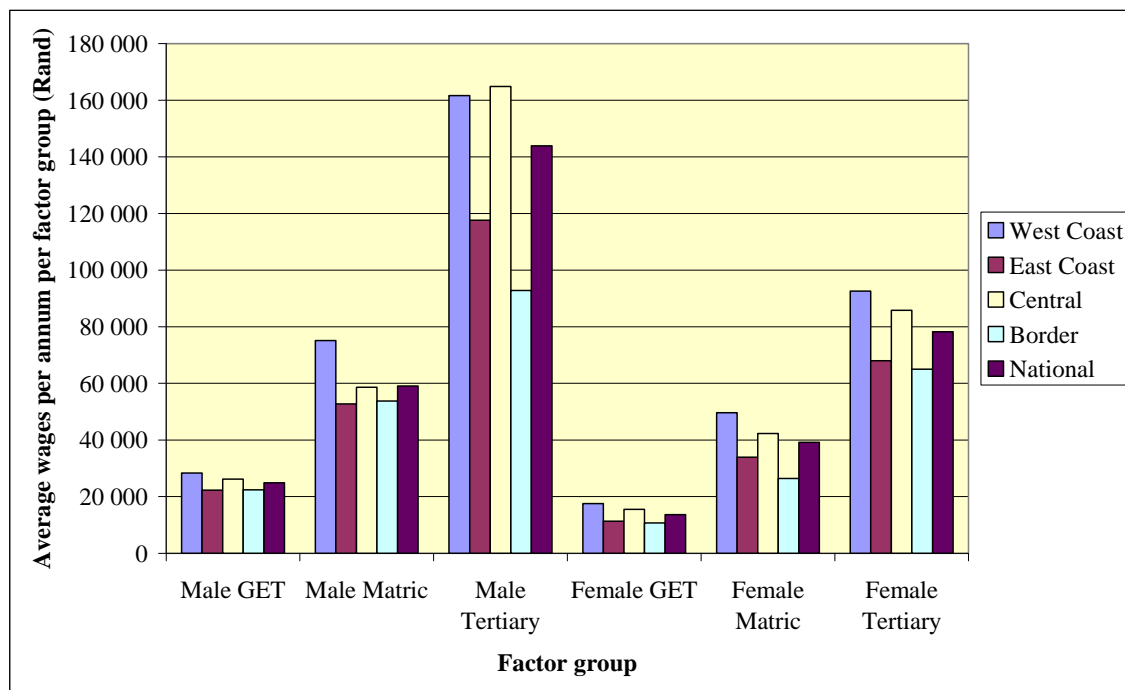
From the satellite account data from the IES/LFS 2000 on hours worked by each factor group per production sector, it can be seen that there is considerable variation between different economic sectors in the factor composition (see Figure 5). Forty five per cent of all female employees with low education (none to GET level) are employed in the Other Services sector, and this group also represents 39 per cent of the work force employed in Other Services. As expected, the male dominated industries are Mining and Construction with, respectively, 97 and 94 per cent of the work force being male.

Figure 5: Share contribution hours worked of factor groups, by production groups
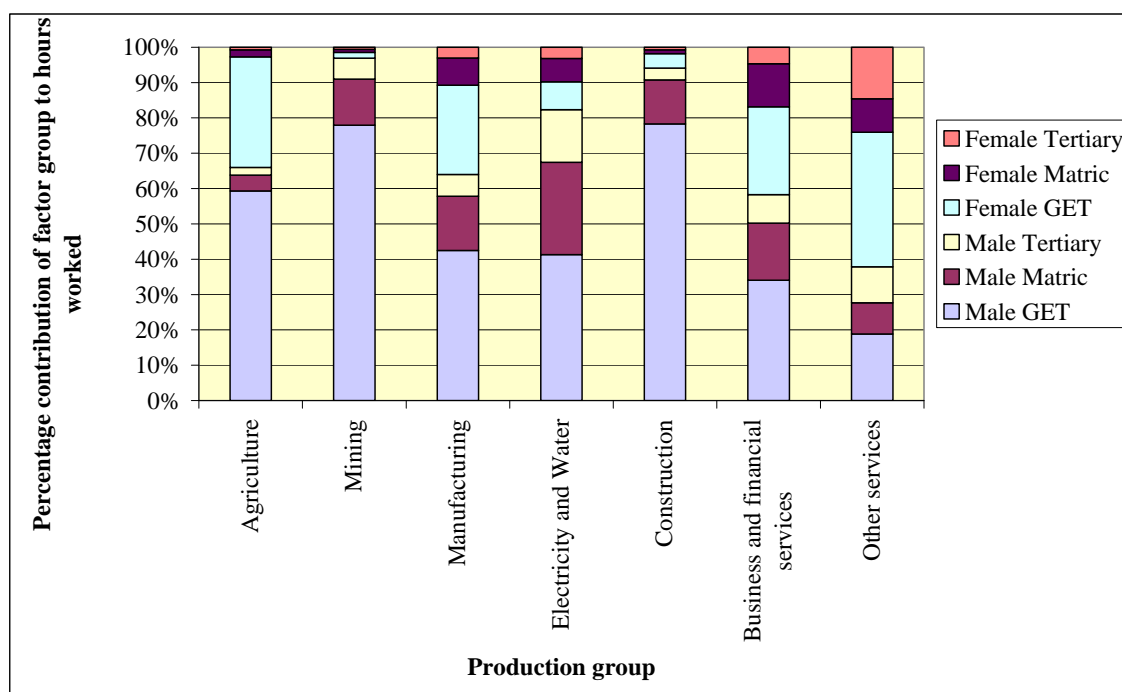
10.4.   Selected households statistics from the input-output SAM

Besides income from labour, household also derive income from transfers from government, enterprises, other households (inter-household transfers), remittances and income from gross operating surplus (GOS). GOS income comprise returns to capital as well as income earned from entrepreneurial activities/management of own business. Figure 6 indicates the share of income from the different sources for different household classifications, i.e. location, type of dwelling, race and income level. Remittance from abroad are not reflected in the figure because of the negligible magnitude thereof. The comparison on an income base clearly shows the greater dependence on government transfers of lower income households (28.8 per cent of total income for ultra poor households) compared to high income households (1.5 per cent).

Figure 6: **Share contribution of income sources to household income for different household classifications**

Households by a) location, b) dwelling type, c) race, d) income level
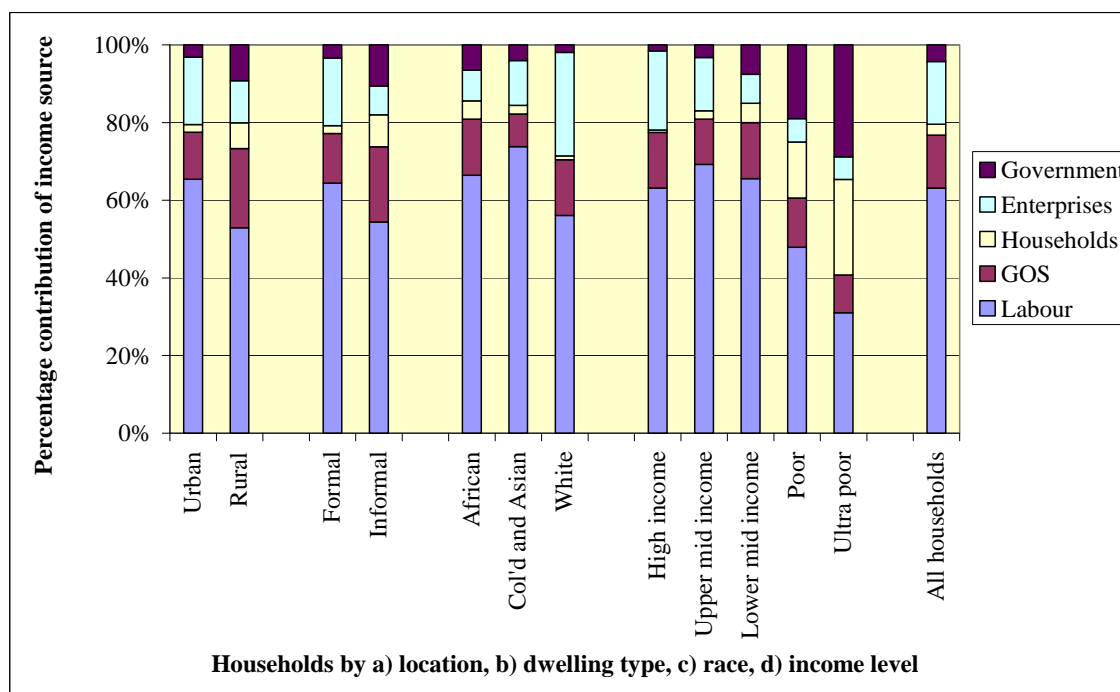
Figure 7 confirms that low income households spend a greater proportion of their income on food (unprocessed and processed) relative to high income households, with the ultra poor households spending 56 per cent of their income on food, compared to 13 per cent by high income households and the national average of 22 per cent. Following the same argument, it can be deduced that on average rural households are relatively poorer that urban households, because rural households spend 34 per cent of their income on food, compared to only 19 per cent by urban households. Consumption expenditure of manufactured goods, excluding food, shows no significant difference for any of the household category criteria, with share of total expenditure on other manufacturing products ranging between 22 and 26 per cent for all household groups. Expenditure on 'other services' which includes, education, government services, social and health care, and domestic services, range between six per cent for ultra poor households and 14 per cent for high income households.

Figure 7: Expenditure shares for different household classifications
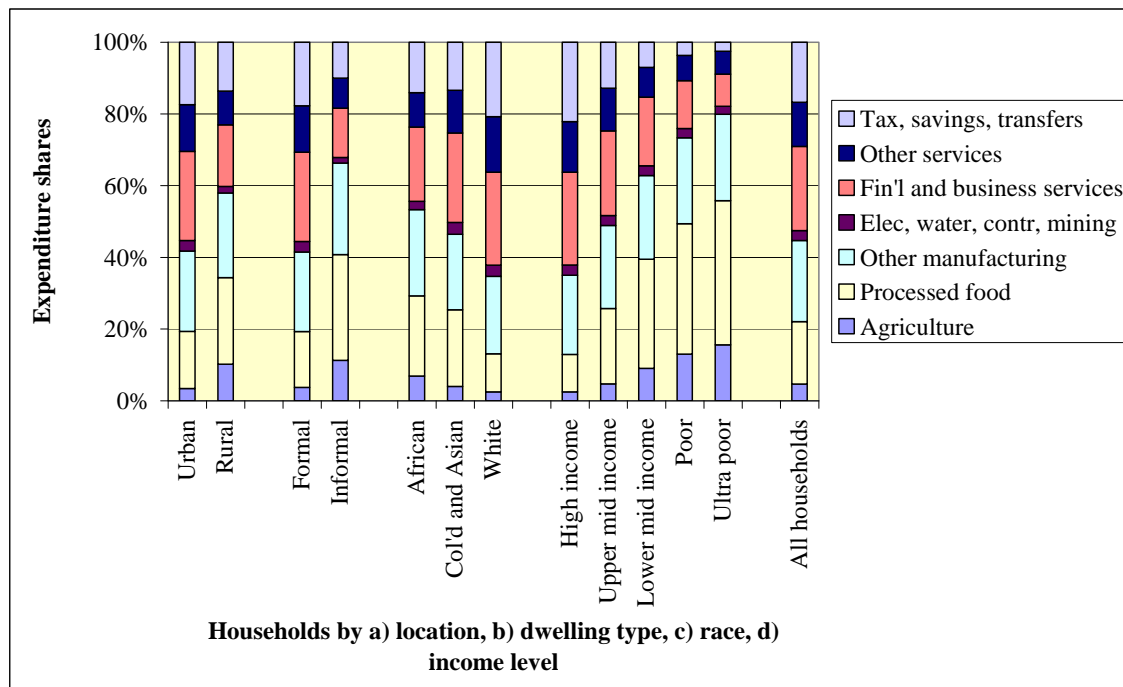
10.5. <u>Time Use Patterns of South African Households</u>

The following time use activity groups and sub-groups were initially created in order to analyse the average amount of time spent per day on these activities by the various household and factor groups (with UN Classification System activity codes shown in brackets):

- 1 – Collecting water (250, 258)
- 2 - Collecting fuel (236)
- 3 – Social care (510 to 538, 550 to 562, 590, 671 to 688)
    - o 31 – Child care (510 to 538)
    - o 32 – Social care (550 to 562, 590, 671 to 688)
- 4 – Health care (540, 580, 588)
- 5 – Home maintenance and community services (410, 420, 430 to 498, 610 to 660, 690)
    - o 51 – Preparing food and drinks (410)
    - o 52 – Cleaning and upkeep of dwelling (420)
    - o 53 – Other home maintenance (430 to 498)
    - o 54 – Community services (610 to 660, 690)
- 6 – Leisure and personal care (710 to 790, 810 to 890, 910 to 990, 010, 020 to 090)
    - o 61 – Leisure (710 to 790, 810 to 890, 910 to 990)
    - o 62 – Sleep (010)
    - o 63 – Necessary care (020 to 038, 050 to 090)
    - o 64 – Receiving care (041 to 048)
- 7 – SNA Production (111 to 230, 240, 260 to 390)
- 8 – Unclassified (any codes not listed in the UN Classification System activity code list)

A variable indicating the labour force status of each respondent aged between 15 and 65 years old was created. Thus, each respondent was classified as either employed, unemployed, not economically active, or not of working age. Tables were then created to indicate the average number of minutes spent per day on each of the activities by household and factor groups, according to labour force status. A table was also created showing the average amount of time spent per day on each of the activities by households and factor groups irrespective of their labour force status.

The high level of disaggregation of the time use data, namely through the creation of 36 household groups, 24 factor groups, 8 time use classifications, and subsequent categorisation according to labour force status, resulted in problems with sample size. Many cells in the resultant tables had few, if any, observations and this was particularly evident for those tables in which the labour force status was either unemployed or not economically active. The lack of observations made it difficult to make meaningful comparisons across the various household and factor groups regarding their time use patterns.

In order to address this problem, it was decided to further aggregate some of the factor and household accounts as well as some of the unpaid activities. More specifically, the number of household groups was reduced from 36 to 20. This was achieved by reducing the number of income groups from five to three. Originally, the five income groups were ultra-poor, poor, low-middle income, upper-middle income, and high-income. The number of income groups was reduced to three by re-classifying the low-middle income, upper-middle income, and high-income groups as non-poor. Thus, the three resultant income groups were ultra poor, poor and non-poor.

The number of factor groups was also reduced from 24 to 4. Initially, the 24 factor groups created were based on region of residence[33], gender and education level. However, by basing the factor groups on gender and education level only, as well as by reducing the number of education levels, the number of factor groups was reduced to four. In the initial stage of the analysis, the following three categories for education level were created[34]:
- None, GET and other;
- Matric; and
- Tertiary

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[33] The four regions that were created in the initial stage of the analysis, based on the nine provinces of South Africa, were as follows:
- West Coast: This region covers the Western Cape and the Northern Cape
- East Coast: This region includes the Eastern Cape and KwaZulu-Natal
- Central: This region consists of Free State, North West and Gauteng
- Border: This region includes Mpumalanga and the Northern Province

[34] The rationale for creating these three education levels is discussed in section 4.4.3.

The number of education levels was subsequently reduced to two, by merging the matric and tertiary education levels. This resulted in the following two education levels:
- GET or below
- Above GET

The number of time use categories was reduced from eight to six, by aggregating some of the unpaid categories. This resulted in the following six time use categories (with UN Classification System activity codes shown in brackets):
- 1 – Water and Fuel Collection (250, 258, 236)
- 2 – Social Care (510 to 590, 610 to 690)
- 3 – Home Maintenance (410 to 498)
- 4 – Unproductive Time (010 to 090, 710 to 790, 810 to 890, 910 to 990)
  - o 41 – Leisure (710 to 790, 810 to 890, 910 to 990)
  - o 42 – Sleep (010)
  - o Necessary Care (020 to 090)
- 5 – SNA Production (111 to 190, 210 to 230, 240, 260 to 290, 310 to 390)
- 6 – Unclassified (any codes not listed in the UN Classification System activity code list)

10.5.1.   Initial Results Obtained

This section reports on the initial results that were obtained, prior to the re-aggregation of some of the household and factor groups as well as unpaid activities.

Table 33 shows a breakdown of employment status according to race. A total of 6,524 individuals, or 45.7 per cent of the sample, are classified as employed. The unemployed constitute 7.8 per cent of the sample (1,114 individuals), whilst those who are not economically active and those who are not working age constitute 25.4 per cent (3621 individuals) and 21.1 per cent (3,013 individuals) of the sample respectively. The highest rate of unemployment is amongst Africans, with 963 African individuals, or 8.8 per cent of the sample being unemployed. Coloureds/Asians have an unemployment rate of 6.4 per cent, whilst the unemployment rate for whites is much lower at 1.98 per cent. Coloureds/Asians had the highest rate of individuals who were classified as not economically active at 26.8 per cent, and this was followed by 25.7 per cent of African individuals who were classified as not economically active. In comparison 20.8 per cent of whites were classified as not economically active. Finally, whereas 54.4 per cent of whites are classified as employed, only 44.2 per cent of Africans are employed.

Table 33:   Employment Status by Race

Race	Employed	Unemployed	Not Economically Active	Not Working Age	*Total*
African	4823	963	2808	2314	*10908*
Coloured/Asian	904	122	508	365	*1899*
White	797	29	305	334	*1465*
Total	*6524*	*1114*	*3621*	*3013*	*14272*

Table 34 shows a breakdown of factor groups according to race. The discrepancy in education levels amongst South Africans is evident from the fact that the modal level of education for all white factor groups is a tertiary education, whereas for both African and Coloured/Asian factor groups, the modal level of education is none, GET or other.

Table 34:   Factor Groups According to Race

Factor Groups		Race			
Region and Gender	Education Level	African	Col/Asian	White	*Total*
West Coast Male	None, GET, other	450	408	63	*921*
	Matric	30	61	62	*153*
	Tertiary	28	46	87	*161*
West Coast Female	None, GET, other	418	583	81	*1,082*
	Matric	50	55	67	*172*
	Tertiary	40	54	90	*184*
East Coast Male	None, GET, other	1,197	164	42	*1,403*
	Matric	99	43	35	*177*
	Tertiary	110	36	81	*227*
East Coast Female	None, GET, other	1,512	205	42	*1,759*
	Matric	126	45	42	*213*
	Tertiary	154	30	87	*271*
Central Male	None, GET, other	1,573	48	82	*1,703*
	Matric	150	2	52	*204*
	Tertiary	178	13	112	*303*
Central Female	None, GET, other	1,744	65	97	*1,906*
	Matric	137	11	73	*221*
	Tertiary	163	12	112	*287*
Border Male	None, GET, other	1,061	4	25	*1,090*
	Matric	104	1	19	*124*
	Tertiary	96	3	35	*134*
Border Female	None, GET, other	1,264	7	23	*1,294*
	Matric	109	3	22	*134*
	Tertiary	115	0	34	*149*
Total		*10,908*	*1,899*	*1,465*	*14,272*

Source: TUS 2000

Table 35: Household and Factor Groups

Household Groups		Factor Groups											
		West Coast Males			West Coast Females			East Coast Males			East Coast Females		
Stratum and Race	Income Level	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary
Urban Formal African	High	3	2	1	1	2	2	0	2	6	0	1	7
	Upper Middle	13	2	8	10	2	6	14	6	18	22	7	24
	Lower Middle	54	1	2	41	7	10	85	19	19	91	26	34
	Poor	35	3	4	39	2	5	96	15	20	121	22	26
	Ultra Poor	26	4	0	22	2	1	63	5	8	113	11	6
Urban Formal Coloured / Asian	High	8	2	7	6	8	3	8	3	5	7	2	8
	Upper Middle	59	23	20	80	19	27	16	17	14	39	10	11
	Lower Middle	86	11	7	149	10	11	66	17	11	67	23	7
	Poor	41	11	2	63	4	2	30	3	3	35	8	3
	Ultra Poor	24	1	2	43	3	1	13	0	1	19	1	0
Urban Formal White	High	23	22	42	24	25	43	10	17	31	9	14	26
	Upper Middle	13	13	15	30	16	16	14	7	29	15	15	30
	Lower Middle	5	7	1	10	6	5	9	6	5	9	5	10
Urban Informal African	High	0	1	1	1	0	1	1	0	0	0	0	0
	Upper Middle	25	4	0	6	1	1	18	1	2	10	3	4
	Lower Middle	82	5	9	69	14	8	91	13	6	90	11	7
	Poor	68	2	2	90	15	3	101	10	10	126	8	7
	Ultra Poor	53	3	1	74	2	2	95	10	1	142	10	7
Rural Commercial African	High	0	0	0	0	0	0	0	0	1	0	0	2
	Upper Middle	5	0	0	0	0	0	24	0	1	3	1	1
	Lower Middle	36	0	0	20	1	0	74	2	0	43	5	2
	Poor	20	0	0	8	1	0	73	1	0	63	0	0
	Ultra Poor	18	0	0	25	1	0	70	0	0	74	1	1
Rural Commercial Coloured / Asian	High	2	0	1	2	0	1	0	0	0	0	0	0
	Upper Middle	4	1	3	6	1	2	1	1	1	3	0	1
	Lower Middle	86	5	3	89	6	2	11	0	0	3	1	0
	Poor	72	5	1	89	2	0	7	1	0	20	0	0
	Ultra Poor	22	1	0	47	0	2	8	0	0	7	0	0
Rural Commercial White	High	4	11	11	2	7	7	2	2	6	2	2	9
	Upper Middle	9	4	10	6	9	7	4	2	7	3	4	7
	Lower Middle	4	6	4	2	1	8	1	1	1	3	0	2
Ex-homeland African	High	0	0	0	0	0	0	1	0	0	0	0	1
	Upper Middle	1	0	0	1	0	0	6	0	5	14	2	4
	Lower Middle	2	0	0	6	0	0	45	1	8	69	4	11
	Poor	2	0	0	3	0	0	114	9	3	196	8	6
	Ultra Poor	0	0	0	0	0	0	207	3	2	312	6	3
Total		*905*	*150*	*157*	*1,064*	*167*	*176*	*1,378*	*174*	*224*	*1,730*	*211*	*267*

Table 35 continued…

Household Groups		Factor Groups												Total
		Central Males			Central Females			Border Males			Border Females			
Stratum and Race	Income Level	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	
Urban Formal African	High	7	3	20	7	4	12	2	0	5	1	0	6	*94*
	Upper Middle	79	21	33	46	13	40	29	14	19	19	11	21	*477*
	Lower Middle	178	33	36	188	38	44	79	16	16	81	20	34	*1,152*
	Poor	151	16	15	195	17	19	65	10	11	74	15	10	*986*
	Ultra Poor	154	9	8	181	12	7	40	8	4	55	7	4	*750*
Urban Formal Coloured / Asian	High	1	0	8	4	1	4	1	0	0	1	0	0	*87*
	Upper Middle	8	0	0	9	3	3	1	0	2	1	1	0	*363*
	Lower Middle	15	2	2	15	2	1	2	1	1	2	2	0	*510*
	Poor	9	0	0	21	1	1	0	0	0	0	0	0	*237*
	Ultra Poor	9	0	1	15	2	1	0	0	0	0	0	0	*136*
Urban Formal White	High	15	12	53	24	26	53	9	8	17	4	10	15	*532*
	Upper Middle	23	8	26	24	17	26	3	1	5	7	2	8	*363*
	Lower Middle	20	2	4	19	9	7	1	1	2	1	2	2	*148*
Urban Informal African	High	0	0	1	1	0	0	1	0	0	0	0	0	*8*
	Upper Middle	29	5	3	16	2	3	16	4	4	16	4	3	*180*
	Lower Middle	152	18	20	175	12	3	97	11	4	92	5	5	*999*
	Poor	153	10	3	172	8	13	73	6	1	106	3	5	*995*
	Ultra Poor	168	8	8	228	10	2	71	1	0	115	4	0	*1,015*
Rural Commercial African	High	0	0	3	0	0	1	9	3	1	0	0	2	*22*
	Upper Middle	8	2	3	6	0	2	30	3	0	1	0	0	*90*
	Lower Middle	73	1	5	55	5	2	68	4	1	46	0	0	*443*
	Poor	78	3	1	67	0	0	71	4	2	64	1	1	*458*
	Ultra Poor	129	1	0	145	2	0	66	1	3	102	2	0	*641*
Rural Commercial Coloured / Asian	High	0	0	0	0	0	0	0	0	0	0	0	0	*6*
	Upper Middle	0	0	2	1	0	0	0	0	0	0	0	0	*27*
	Lower Middle	6	0	0	2	2	1	0	0	0	0	0	0	*217*
	Poor	1	0	0	3	0	0	0	0	0	2	0	0	*203*
	Ultra Poor	0	0	0	0	0	0	0	0	0	0	0	0	*87*
Rural Commercial White	High	4	13	14	5	8	15	2	2	3	4	2	3	*140*
	Upper Middle	6	13	11	13	6	8	4	4	5	2	5	2	*151*
	Lower Middle	9	3	3	7	5	3	6	1	2	5	0	2	*79*
Ex-homeland African	High	1	0	0	0	0	0	0	0	0	0	0	1	*4*
	Upper Middle	11	0	3	5	1	2	14	2	7	8	2	4	*92*
	Lower Middle	42	5	5	56	4	6	75	4	8	100	13	12	*476*
	Poor	62	5	5	72	3	4	123	6	4	178	16	4	*823*
	Ultra Poor	81	8	4	105	3	3	128	7	6	198	7	4	*1,087*
Total		*1,682*	*201*	*300*	*1,882*	*216*	*286*	*1,086*	*122*	*133*	*1,285*	*134*	*148*	*14,078*

Table 35 shows a breakdown of the number of individuals in the various household and factor groups. It is immediately apparent that this level of disaggregation results in a problem with a lack of observations for many of the household and factor groups. Indeed, there are zero observations for 214 of the 864 cells in this table, or 25 per cent of the cells.

Table 36 shows the average amount of time spent per day on non-SNA production according to factor and household groups. Of the various factor groups, Border females with matric spend the highest amount of time per day on non-SNA production, at an average of 283 minutes per day, whilst West Coast males with matric spend the least amount of time per day on non-SNA production, at an average of 62 minutes per day. For all factor groups, males spend far less time than their female counterparts on non-SNA production. For example, whereas East Coast males with matric spend an average of 88 minutes per day on non-SNA production, East Coast females with matric spend more than double this amount of time on non-SNA production activities, at an average of 245 minutes per day. This finding is to be expected, since it is widely acknowledged that females spend more time than males on unpaid work, or non-SNA production.

A clear pattern emerges for four of the household groups, whereby the ultra poor spend the highest amount of time per day on non-SNA production whilst those with upper middle income spend the least amount of time per day on non-SNA production. The household groups for which this pattern is evident are urban formal Africans, urban formal Coloured/Asians, urban informal Africans, and ex-homeland Africans. A similar pattern is also evident for rural commercial Africans, in which, once again, the ultra poor spend the highest amount of time per day on non-SNA production whilst those with high income spend the least amount of time per day on these activities. Similarly, for urban formal whites and rural commercial Coloured/Asians, those with high income spend the least amount of time per day on non-SNA production. Thus, the overall pattern that emerges for the household groups is that the lower the household income level, the greater the average amount of time spent per day on non-SNA production is likely to be. Conversely, households with higher income levels are likely to spend less time on non-SNA production. One reason for this pattern is that as household income increases, the household is more able and likely to employ someone to perform the necessary non-SNA production activities on their behalf. The one exception to this pattern is for rural commercial whites. The general pattern for this household group is reversed, with those with a high level of income spending the most amount of time per day on non-SNA production and those with lower income spending the least amount of time per day on non-SNA production.

Table 36:   Average Number of Minutes per Day Spent on Non-SNA Activities by Household and Factor Groups

Household Groups		Factor Groups											
		West Coast Males			West Coast Females			East Coast Males			East Coast Females		
Stratum and Race	Income Level	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary
Urban Formal African	High	47	84	60	150	181	168		31	74		160	82
	Upper Middle	71	39	60	157	82	322	43	51	61	156	145	186
	Lower Middle	78	0	25	221	175	312	77	64	56	184	183	162
	Poor	43	1	139	207	197	124	90	60	67	175	265	279
	Ultra Poor	87	10		297	243	285	65	80	129	197	266	234
Urban Formal Coloured / Asian	High	24	0	286	133	137	23	27	6	156	140	342	139
	Upper Middle	46	56	52	124	186	165	51	19	107	164	238	214
	Lower Middle	69	46	115	187	109	311	75	27	12	219	306	135
	Poor	72	6	528	176	131	73	90	29	68	179	160	305
	Ultra Poor	50	15	33	228	68	135	73		0	281	160	
Urban Formal White	High	73	107	155	149	213	227	100	42	89	80	206	211
	Upper Middle	127	135	257	173	276	189	44	5	114	198	192	211
	Lower Middle	223	72	85	57	288	127	35	196	115	198	203	329
Urban Informal African	High		165	200	45		60	375					
	Upper Middle	137	86		346	105	75	91	315	90	186	424	142
	Lower Middle	90	133	76	240	254	197	80	126	17	248	204	331
	Poor	97	370	11	234	347	344	103	196	234	191	243	387
	Ultra Poor	78	93	150	287	383	416	92	255	0	258	221	393
Rural Commercial African	High									135			110
	Upper Middle	177						95		20	76	85	195
	Lower Middle	125			238	270		141	103		282	189	138
	Poor	90			362	34		70	90		252		
	Ultra Poor	79			381	240		50			319	60	435
Rural Commercial Coloured / Asian	High	72		0	172		60						
	Upper Middle	102	540	140	304	70	343	30	45	415	77		285
	Lower Middle	55	97	90	243	238	383	57			384	150	
	Poor	83	99	45	265	154		115	180		169		
	Ultra Poor	55	40		225		187	97			371		
Rural Commercial White	High	79	39	40	418	413	455	20	17	166	81	309	234
	Upper Middle	54	7	79	166	279	362	59	121	24	88	69	199
	Lower Middle	104	30	104	46	415	257	15	15	15	250		422
Ex-homeland African	High							0					195
	Upper Middle	30			65			120		49	146	418	93
	Lower Middle	284			192			122	10	114	300	463	257
	Poor	18			90			106	142	172	235	224	395
	Ultra Poor							94	272	27	281	432	488
Total		*71*	*62*	*155*	*197*	*203*	*211*	*90*	*88*	*94*	*242*	*245*	*248*

| Household Groups | | Factor Groups | | | | | | | | | | | | Total |
| Stratum and Race | Income Level | Central Males | | | Central Females | | | Border Males | | | Border Females | | | |
		None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	
Urban Formal African	High	107	197	131	88	167	227	98		59	510		130	*140*
	Upper Middle	87	81	62	183	318	162	84	58	84	155	249	250	*131*
	Lower Middle	64	86	124	198	215	225	60	163	88	235	290	211	*141*
	Poor	66	164	69	208	265	242	82	220	110	172	262	326	*148*
	Ultra Poor	75	59	39	225	250	325	99	163	117	182	299	151	*154*
Urban Formal Coloured / Asian	High	120		46	87	60	145	35			415			*108*
	Upper Middle	8			97	69	128	60		130	0	570		*103*
	Lower Middle	102	39	366	262	50	600	10	0	270	197	216		*141*
	Poor	23			189	95	105							*134*
	Ultra Poor	91		175	145	422	105							*156*
Urban Formal White	High	66	11	73	154	145	174	35	25	127	0	141	209	*125*
	Upper Middle	43	65	113	88	236	228	29	210	151	122	228	257	*145*
	Lower Middle	39	22	23	192	501	180	135	50	97	45	100	311	*210*
Urban Informal African	High			80	475			55						*157*
	Upper Middle	116	70	23	200	244	155	82	88	82	126	154	136	*139*
	Lower Middle	84	92	216	260	267	284	104	67	16	216	112	258	*164*
	Poor	125	93	253	267	243	323	81	128	120	245	407	386	*188*
	Ultra Poor	82	236	95	242	292	280	93	300		296	368		*189*
Rural Commercial African	High			90			340	5	124	40			164	*87*
	Upper Middle	106	77	114	138		457	105	25		405			*116*
	Lower Middle	83	0	62	204	298	206	93	151	20	249			*156*
	Poor	77	75	450	237			94	114	80	238	90	285	*152*
	Ultra Poor	85	135		237	263		87	0	118	284	400		*183*
Rural Commercial Coloured / Asian	High													*95*
	Upper Middle			123	60									*202*
	Lower Middle	61			230	286	400							*142*
	Poor	20			164						89			*165*
	Ultra Poor													*201*
Rural Commercial White	High	50	30	61	211	215	143	10	92	70	250	420	169	*141*
	Upper Middle	88	21	59	199	257	494	37	77	233	12	187	310	*133*
	Lower Middle	28	34	225	69	168	243	59	150	50	266		92	*124*
Ex-homeland African	High	115											465	*184*
	Upper Middle	195		88	345	210	231	151	130	84	194	291	389	*166*
	Lower Middle	125	157	261	223	338	129	80	76	95	192	339	184	*182*
	Poor	168	152	90	269	235	325	102	140	139	225	285	363	*189*
	Ultra Poor	83	178	384	267	298	302	80	105	131	254	325	214	*192*
Total		*83*	*92*	*91*	*220*	*264*	*206*	*86*	*108*	*112*	*225*	*283*	*241*	*163*

Table 37 shows the average amount of time spent per day on non-productive activities by factor and household groups. Two clear patterns are evident regarding the factor groups. Firstly, within each of the male and female factor groups, the average amount of time spent on non-productive activities is greatest for those whose education level is classified as none, GET or other, whilst those with tertiary education spend the least amount of time on non-productive activities. This could possibly be explained by the relationship between income level and unemployment, whereby individuals with low education levels are more likely to be poor and not have sufficient employment. As a result these individuals spend a greater portion of their time on non-productive activities, although they would willingly reduce the amount of time spent on leisure if they were sufficiently employed. Thus, the time spent on non-productive activities is likely picking up forced idleness. Secondly, for all factor groups, males spend more time than their female counterparts on non-productive activities. For example, whereas West Coast males with matric spend an average of 1148 minutes per day on non-productive activities, West Coast females with matric spend an average of 1032 minutes non-productive activities.

Table 37: **Average Number of Minutes per Day Spent on non-Productive Activities by Household and Factor Groups**

Household Groups		Factor Groups											
		West Coast Males			West Coast Females			East Coast Males			East Coast Females		
Stratum and Race	Income Level	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary
Urban Formal African	High	1363	919	855	1290	1259	733		899	858		1280	860
	Upper Middle	1069	840	994	1279	784	755	1209	731	1102	1025	1201	1124
	Lower Middle	1119	585	840	1157	751	943	1214	1148	999	1148	1078	992
	Poor	1217	924	1169	1210	1243	1295	1220	1071	1046	1194	1031	1029
	Ultra Poor	1140	1154		1118	943	1155	1200	1070	1247	1191	1152	1136
Urban Formal Coloured / Asian	High	1354	861	892	1116	1114	914	1256	785	1052	1176	788	984
	Upper Middle	1181	1201	1023	1200	956	911	1116	956	1000	1166	1011	949
	Lower Middle	1198	1320	1144	1178	1086	1033	1234	1095	1016	1090	981	1089
	Poor	1216	1233	912	1187	1309	1294	1212	1053	1068	1216	1201	993
	Ultra Poor	1249	780	1374	1119	891	705	1290		950	1149	1280	
Urban Formal White	High	1279	1023	1025	1196	994	992	1232	1052	1023	1291	1103	931
	Upper Middle	1217	1210	878	1164	1052	1024	1297	1133	1042	1186	1006	913
	Lower Middle	1117	1279	1355	1339	1152	1232	1316	1243	1148	1208	1213	1006
Urban Informal African	High		1275	1240	1395		1380	1065					
	Upper Middle	879	954		963	660	1365	779	1125	588	996	901	1146
	Lower Middle	1101	1090	1231	1081	958	1214	1112	869	1239	1058	933	991
	Poor	1147	1070	1421	1080	1023	1096	1174	987	887	1132	843	1046
	Ultra Poor	1109	1339	1290	1107	946	999	1236	989	825	1105	1007	924
Rural Commercial African	High									900			804
	Upper Middle	771						859		1420	757	815	1245
	Lower Middle	928			936	1170		967	849		927	1074	582
	Poor	951			991	1406		1036	750		1008		
	Ultra Poor	996			991	1200		1163			1041	1080	1005
Rural Commercial Coloured / Asian	High	1228		1440	1262		840						
	Upper Middle	1082	420	726	819	730	853	855	905	845	1094		645
	Lower Middle	1020	1199	804	952	1013	975	1059			1055	1290	
	Poor	1164	992	775	1025	1127		973	1260		1231		
	Ultra Poor	1036	720		1142		1253	1081			1037		
Rural Commercial White	High	1246	813	980	1001	925	856	1153	1326	759	1354	988	987
	Upper Middle	1268	952	845	1076	989	966	1248	1319	886	1352	973	1025
	Lower Middle	1130	698	786	1394	1025	948	800	1005	745	1190		828
Ex-homeland African	High							900					690
	Upper Middle	1400			1375			1120		1304	1074	1012	1115
	Lower Middle	883			1198			1225	890	940	1083	977	954
	Poor	1290			1237			1219	1251	1234	1149	862	996
	Ultra Poor							1236	1155	1413	1095	982	824
Total		*1166*	*1148*	*1009*	*1148*	*1032*	*999*	*1212*	*1071*	*1046*	*1123*	*1042*	*982*

Table 37 continued…

Household Groups		Factor Groups												Total
		Central Males			Central Females			Border Males			Border Females			
Stratum and Race	Income Level	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	Total
Urban Formal African	High	1014	1176	915	1310	1099	858	813		965	930		1081	*992*
	Upper Middle	1085	1008	1061	1131	954	896	1161	939	1160	1196	1029	949	*1053*
	Lower Middle	1173	1068	1007	1136	1078	1030	1204	1084	1061	1064	902	1074	*1121*
	Poor	1259	1185	1173	1169	1090	1085	1262	1035	1067	1172	1040	1028	*1181*
	Ultra Poor	1269	1329	1117	1141	1108	1113	1272	1118	1323	1158	1123	1289	*1192*
Urban Formal Coloured / Asian	High	720		983	1159	720	899	955			1010			*1050*
	Upper Middle	1166			1228	1040	1258	1380		905	1440	870		*1116*
	Lower Middle	1196	1154	881	991	1372	810	1430	945	1170	1243	1224		*1157*
	Poor	1227			1138	1000	750							*1194*
	Ultra Poor	1262		1065	1275	1018	855							*1182*
Urban Formal White	High	1232	1140	959	1237	985	932	1228	1012	1091	1428	1192	1028	*1054*
	Upper Middle	1300	959	964	1254	987	1031	1093	1230	978	1313	1200	886	*1085*
	Lower Middle	1212	775	1086	1225	870	1068	750	1345	874	1380	959	926	*1117*
Urban Informal African	High			730	965			1000						*1247*
	Upper Middle	897	1048	1010	1061	948	1109	1114	885	1112	1003	970	829	*942*
	Lower Middle	1019	952	963	1068	896	1115	1121	1160	1178	1048	1155	972	*1050*
	Poor	1158	1189	1053	1058	965	987	1157	1133	1320	1117	1033	1038	*1107*
	Ultra Poor	1267	1034	937	1151	1084	1140	1208	930		1066	1072		*1161*
Rural Commercial African	High			1124			1100	1030	987	785			861	*989*
	Upper Middle	1141	670	826	789		983	976	1138		1035			*926*
	Lower Middle	1058	1440	698	1058	1028	681	977	846	970	934			*989*
	Poor	1082	1101	990	1113			997	1071	1295	1112	660	1155	*1063*
	Ultra Poor	1079	1305		1101	927		1119	910	1088	1043	745		*1084*
Rural Commercial Coloured / Asian	High													*1270*
	Upper Middle			819	810									*883*
	Lower Middle	1194			1193	1126	890							*1024*
	Poor	855			865						1172			*1106*
	Ultra Poor													*1079*
Rural Commercial White	High	1163	870	919	1073	1116	1042	1224	1348	890	1181	895	950	*994*
	Upper Middle	820	971	946	1038	972	869	1403	967	1084	1428	952	845	*1039*
	Lower Middle	1098	861	941	1366	1251	878	1278	830	825	1010		822	*1046*
Ex-homeland African	High	550											975	*795*
	Upper Middle	1054		870	930	810	1209	1229	1210	946	1161	1149	802	*1089*
	Lower Middle	1133	825	825	1117	1102	902	1214	1085	881	1167	1071	1032	*1123*
	Poor	1149	1284	997	1147	1077	882	1213	1206	1275	1163	1003	1068	*1166*
	Ultra Poor	1217	1220	884	1148	843	923	1308	1264	1108	1127	967	1035	*1172*
Total		*1187*	*1084*	*995*	*1142*	*1009*	*975*	*1236*	*1119*	*1036*	*1142*	*1026*	*1012*	*1134*

Table 38 shows the average number of minutes spent per day on SNA-productive activities by the employed for factor and household groups. For three of the four female factor groups (namely East Coast, Central and Border females) and for two of the four male factor groups (namely Central and Border males), the average amount of time spent on SNA-productive activities by the employed is greatest for those who have a tertiary education and least for those whose education level is classified as none, GET or other.

For all factor groups, except those from the Border region with a matric or tertiary education, males spend more time than their female counterparts on SNA-productive activities. This finding is also to be expected since it is acknowledged that men are more likely to engage in the production of goods and services that are exchanged in the market, or SNA-production. For example, whereas Central males with tertiary education spend an average of 471 minutes per day on SNA-productive activities, Central females with tertiary education spend an average of 431 minutes SNA-productive activities.

For five of the eight household groups, those with a high level of income work longer hours than the poor or ultra poor. This applies to urban formal Africans, urban formal Coloured/Asians, urban formal whites, rural commercial Coloured/Asians, and ex-homeland Africans. Presumably those with a high income level are more likely to be in full-time employment whereas the poor and ultra-poor work are not fully employed but find work on an hourly basis. Urban informal Africans and rural commercial Africans with a high level of income appear to spend far less time on SNA-productive activities than any of the other income levels within their household group, at an average of 77 minutes and 383 minutes respectively. However, this finding is most likely a result of the lack of observations for high income Africans within the urban informal and rural commercial strata.

Table 38: **Average Number of Minutes per Day Spent by the Employed on SNA-Productive Activities by Factor and Household Groups**

Household Groups		Factor Groups											
		West Coast Males			West Coast Females			East Coast Males			East Coast Females		
Stratum and Race	Income Level	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary
Urban Formal African	High	540	450	525	0	0	539		509	578			495
	Upper Middle	582	561	428	18	575	363	340	725	458	538	455	347
	Lower Middle	585	855	575	611	663	358	526	549	422	322	449	480
	Poor	604	710		467		44	330	461	339	267	421	259
	Ultra Poor	575	284		165	480		397	585	202	169	0	99
Urban Formal Coloured / Asian	High	353	579	315	522	279	600	540	649	559	553	675	462
	Upper Middle	614	335	485	454	387	581	580	606	457	365	294	442
	Lower Middle	584	149	376	357	583	228	365	537	404	508	361	445
	Poor	508	450	0	295	0		442	555	525	257		570
	Ultra Poor	598	600		334	780	600	283		490	128		
Urban Formal White	High	356	545	498	402	429	437	490	526	543	674	563	433
	Upper Middle	295	357	522	587	192	302	602	406	531	256	487	447
	Lower Middle	555	159	0	360		310	555		630	570		0
Urban Informal African	High		0	0									
	Upper Middle	490	612					677			572	555	690
	Lower Middle	471	202	439	320	538	540	378	484	150	328	564	132
	Poor	598	0		448	118		347	600	640	301	583	15
	Ultra Poor	518			173	480	395	295	590		220	231	170
Rural Commercial African	High									405			526
	Upper Middle	516						575			607	540	
	Lower Middle	588			366			436			463	428	720
	Poor	549			226			494	600		439		
	Ultra Poor	644			249			491			204	300	
Rural Commercial Coloured / Asian	High	720					540						
	Upper Middle	658	480	572	627	640	480		490	180	434		510
	Lower Middle	525	573	603	412	446	575	578					
	Poor	472	568	620	414	525		418	0		223		
	Ultra Poor	601	680		295			356			113		
Rural Commercial White	High	590	618	502		505	333	790	600	606		330	212
	Upper Middle	501	576	623	539	318	405			667		512	214
	Lower Middle		767	549			344	625		680			435
Ex-homeland African	High												555
	Upper Middle							376		344	424		220
	Lower Middle				345			256		437	294	0	400
	Poor							379	810		236	424	110
	Ultra Poor							314	0	0	204	34	
Total		547	389	450	376	375	428	380	474	449	259	353	360

Table 38 continued…

Household Groups		Central Males			Central Females			Border Males			Border Females			Total
Stratum and Race	Income Level	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	
Urban Formal African	High	469	690	520		174	468	529		456			375	468
	Upper Middle	453	438	460	308	277	514	516	492	304	438	264	515	438
	Lower Middle	459	407	393	281	429	352	491	537	378	293	430	339	405
	Poor	339	218	294	191	0	242	296	337	488	381	296		301
	Ultra Poor	229	179	358	290	58		236	436		255			268
Urban Formal Coloured / Asian	High	600		410	610	660	430	450			0			451
	Upper Middle	61			108	508	420			420				461
	Lower Middle	228	720	194	383	18	30		495					401
	Poor	441			496	345	585							388
	Ultra Poor	187		200	172		480							402
Urban Formal White	High	398	526	552	334	393	474	414	635	412		423	434	480
	Upper Middle	526	564	525	418	318	345	465	0	313			348	432
	Lower Middle	447	655	508	107	405	517	555	45			377	540	337
Urban Informal African	High			630				385						77
	Upper Middle	516	642	668	463	480	750	515	466	270	554	480	475	569
	Lower Middle	478	538	324	271	476		401	434	120	415	538	480	404
	Poor	343	183	193	313	570	181	514	228	0	299			345
	Ultra Poor	210	302	666	201	252		270	210		260			244
Rural Commercial African	High			414			0	402	329				415	383
	Upper Middle	387	694	501	513		0	540	401					521
	Lower Middle	494	0	679	369	340	840	524	605	450	420			467
	Poor	444	297		196			574	263	615	232	690		427
	Ultra Poor	497			330	510		542	530	536	248	296		400
Rural Commercial Coloured / Asian	High													610
	Upper Middle			498	570									449
	Lower Middle	480				75	150							470
	Poor	565			415						195			371
	Ultra Poor													404
Rural Commercial White	High	426	677	499	106	315	321	600		480		195	469	482
	Upper Middle	587	625	611	360	157	78		554	282		389	570	465
	Lower Middle	720	710	275			447	300	460	565	765		526	520
Ex-homeland African	High	775												669
	Upper Middle	271		516	383	420		162	130	460	690		431	371
	Lower Middle	309	589	473	275		520	305	531	487	292	149	319	350
	Poor	369		456	70	620	532	445	24	0	201	456		301
	Ultra Poor	393	58	155	75		287	125	0	198	175	506		217
Total		383	423	471	257	350	431	359	369	387	249	383	389	368

An unexpected finding that emerged was that certain of those classified as unemployed, not economically active and not of working age indicated that they spent time on SNA-productive activities. This is a contradiction since, if an unemployed person indicated in their diary that they had spent time on an SNA-production activity, then this also implies that they performed the SNA-production activity within the past seven days. Thus, based on the definition of employment, whereby an individual is classified as employed if they have performed any type of economic work within the past seven days, whether paid or unpaid, this person should therefore be classified as employed. Table 39 illustrates this finding for those classified as unemployed. Note that in some cases the length of time spent on SNA-productive activities was quite significant, and occasionally amounted to well over five hours per day. The SSA time use survey report also mentioned this anomaly and states that the discrepancy suggests "that Stats SA's standard employment status questions may not be picking up on all economic activity. This merits further investigation" (SSA, 2001, p.52).

Table 39: **Average Number of Minutes per Day Spent by the Unemployed on SNA-Productive Activities by Factor and Household Groups**

Household Groups		Factor Groups											
		West Coast Males			West Coast Females			East Coast Males			East Coast Females		
Stratum and Race	Income Level	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary
Urban Formal African	High												
	Upper Middle				0			0			371	0	0
	Lower Middle	80			0	0	0	0	247	81	0	0	0
	Poor	107		0	180		0	95	0	145	24	0	150
	Ultra Poor	319	255		0			140	0	0	7	0	
Urban Formal Coloured / Asian	High										0		
	Upper Middle	15	0		43								
	Lower Middle	53	0		58		0	125	0		0	0	
	Poor	18	69		0			360			0	0	
	Ultra Poor	0		315	0			249			0		
Urban Formal White	High		0		0	0			0				
	Upper Middle		0			0	0						
	Lower Middle		0		0	0							0
Urban Informal African	High												
	Upper Middle	0						0					
	Lower Middle	108	570		60	0	5	158	480		11	0	4
	Poor	173			93	7		166	117	0	39	90	
	Ultra Poor	416	0		0			39	48		29	268	0
Rural Commercial African	High												
	Upper Middle												
	Lower Middle							109			150		
	Poor							0			113		
	Ultra Poor				0			192			0		
Rural Commercial Coloured / Asian	High												
	Upper Middle				0								
	Lower Middle	239	0		0	0						0	
	Poor	0	0								0		
	Ultra Poor	0			9						0		
Rural Commercial White	High												
	Upper Middle												
	Lower Middle												
Ex-homeland African	High												
	Upper Middle										0		
	Lower Middle										0	0	0
	Poor							163	0		32	120	0
	Ultra Poor							303			122	60	
Total		*114*	*31*	*48*	*26*	*3*	*1*	*151*	*73*	*71*	*44*	*36*	*38*

Table 39 continued…

| Household Groups | | Central Males | | | Central Females | | | Border Males | | | Border Females | | | Total |
Stratum and Race	Income Level	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	None, GET, Other	Matric	Tertiary	
Urban Formal African	High			0										*0*
	Upper Middle	0				0	0						0	*68*
	Lower Middle	203	131	199	5	0	176		16	0	92	0	0	*91*
	Poor	264	87	140	2	0	50	9	0		90	0	182	*81*
	Ultra Poor	130			18	0	0	21	10	0	0	0		*69*
Urban Formal Coloured / Asian	High													*0*
	Upper Middle	720												*350*
	Lower Middle				0									*43*
	Poor				0									*30*
	Ultra Poor	325			0	0								*94*
Urban Formal White	High			180	0							0		*39*
	Upper Middle		0											*0*
	Lower Middle				0	0	0			585				*36*
Urban Informal African	High													
	Upper Middle		240		0	0				0	25			*97*
	Lower Middle	239	112	103	0	0		72	0	270	0		0	*117*
	Poor	37	390		0	0	0	88	0		53			*79*
	Ultra Poor	175		122	60	0	0	62			51	0		*95*
Rural Commercial African	High													
	Upper Middle						0							*0*
	Lower Middle										105			*123*
	Poor		0		26			0		0	0			*17*
	Ultra Poor	180	0		0			277			189			*139*
Rural Commercial Coloured / Asian	High													
	Upper Middle													*0*
	Lower Middle													*80*
	Poor													*0*
	Ultra Poor													*1*
Rural Commercial White	High													
	Upper Middle												0	*0*
	Lower Middle					0								*0*
Ex-homeland African	High													
	Upper Middle										0			*0*
	Lower Middle	209			127	0	0		0		116	0		*73*
	Poor	51	0					0	0		0			*61*
	Ultra Poor	15	325	345	34	0		210	315		29	0	0	*132*
	Total	*201*	*87*	*143*	*22*	*0*	*60*	*130*	*25*	*267*	*48*	*0*	*72*	*86*

10.5.2. Second Round Results

This section provides a brief overview of some of the results obtained after re-aggregation of some of the unpaid activities as well as household and factor groups.

Table 40:   Household and Factor Groups

HOUSEHOLD GROUPS	FACTOR GROUPS				
	Male Unskilled	Male Skilled	Female Unskilled	Female Skilled	Total
Urb Formal African Non-Poor	386	339	326	426	1477
Urb Formal African Poor	220	115	267	156	758
Urb Formal African Ultra-Poor	188	57	223	93	561
Urb Formal Col/Asi Non-Poor	177	167	261	174	779
Urb Formal Col/Asi Poor	52	23	85	24	184
Urb Formal Col/Asi UltraPoor	35	5	58	8	106
Urb Formal White Non-Poor	78	299	90	344	811
Urb Informal African Non-Poor	420	143	367	124	1054
Urb Informal African Poor	299	60	342	91	792
Urb Informal African Ultra-Poor	269	57	425	66	817
Rur Comm African Non-Poor	286	43	147	36	512
Rur Comm African Poor	209	12	151	7	379
Rur Comm African Ultra-Poor	215	7	266	16	504
Rur Comm Col/Asi Non-Poor	89	22	85	21	217
Rur Comm Col/Asi Poor	60	9	83	4	156
Rur Comm Col/Asi UltraPoor	25	1	41	3	70
Rur Comm White Non-Poor	29	120	25	109	283
Ex-hland African Non-Poor	111	57	144	80	392
Ex-hland African Poor	175	48	257	71	551
Ex-hland African Ultra Poor	217	51	377	59	704
Total	*3540*	*1635*	*4020*	*1912*	*11107*

Table 40 shows a breakdown of the number of individuals in the various household and factor groups. It is obvious that the re-aggregation of some of the household and factor groups has resulted in an increased number of observations for each of the cells. However, there are still an extremely limited number of observations for certain of the household and factor groups, in particular for male and female skilled factors in poor and ultra-poor Coloured/Asian households.

Figure 8 shows the total hours spent per year on unpaid work by broad household groups (excluding income level) of working age and for males and females. For all household groups, it is clear that females spend a significantly greater proportion of their time on unpaid work than males. Ex-homeland African females spend the most amount of time per year on

unpaid activities, at 7.6 billion hours per year, followed by urban formal African females at 5.8 billion hours per year. Although, on average, urban informal African females in the time use survey spend a similar amount of time *per day* on unpaid activities to ex-homeland African females and urban formal African females, the amount translates into fewer total hours *per year* due to the fact that there are slightly less than a third of the amount of Africans in informal areas in comparison to both formal and ex-homeland areas. Figure 8 also clearly indicates how, for every household group, unpaid work is performed predominantly by females. In total, females spend almost 23 billion hours per year on unpaid work, whilst males spend slightly over 7 billion hours per year on unpaid work. Thus, of the total hours dedicated to unpaid work in South Africa, 76 percent is accounted for by women, and the remaining 24 percent by men. For all household groups, over 99.99 percent of the total time spent on unpaid activities is allocated to home maintenance.

Figure 8: Total Hours Spent on Unpaid Work per Year by Household Group and Gender
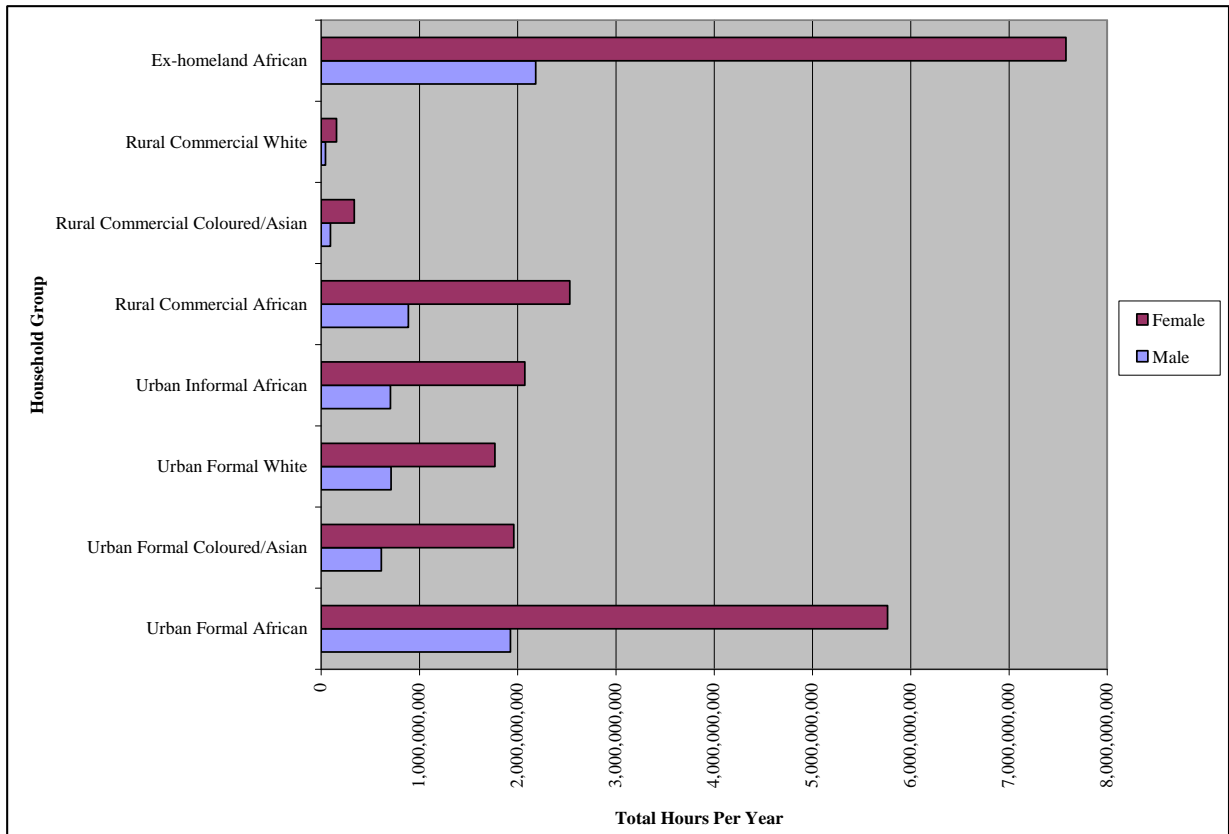
Table 41:   Total Hours Spent per Year by Household Groups per Unpaid Activity Type

Household Group	Gender	Unpaid Time Use Activity		
		Water and Fuel Collection	Social Care	Home Maintenance
Ex-homeland African	Male	1605	1403	1,787,859,900
	Female	5979	8851	5,605,098,313
Rural Commercial African	Male	367	215	801,674,874
	Female	1440	2874	1,951,238,657
Urban Informal African	Male	138	444	626,748,027
	Female	318	2627	1,679,351,605
Urban Formal African	Male	131	1245	1,743,437,568
	Female	176	6661	4,848,877,954
Urban Formal Coloured/Asian	Male	7	981	478,881,630
	Female	12	2869	1,580,559,640
Rural Commercial Coloured/Asian	Male	52	71	79,679,518
	Female	45	452	271,771,219
Urban Formal White	Male	0	737	612,966,205
	Female	19	2587	1,421,219,103
Rural Commercial White	Male	0	30	40,154,867
	Female	0	178	132,213,695

Table 41 shows the total number of hours spent per annum on each of the three unpaid activity types by broad household groups (excluding income level) and gender. The table highlights, amongst others, how the burden of time spent on all unpaid time use activities falls predominantly on women, across all household groups.

Figure 9 shows the proportion of total hours spent per year on unpaid work by race. Africans account for by far the greatest proportion of time spent on unpaid work per year, at 81 percent, followed by Coloured/Asians at 10 percent, and then by whites at 9 percent.

Figure 9: Proportion of Total Hours Spent on Unpaid Work by Race
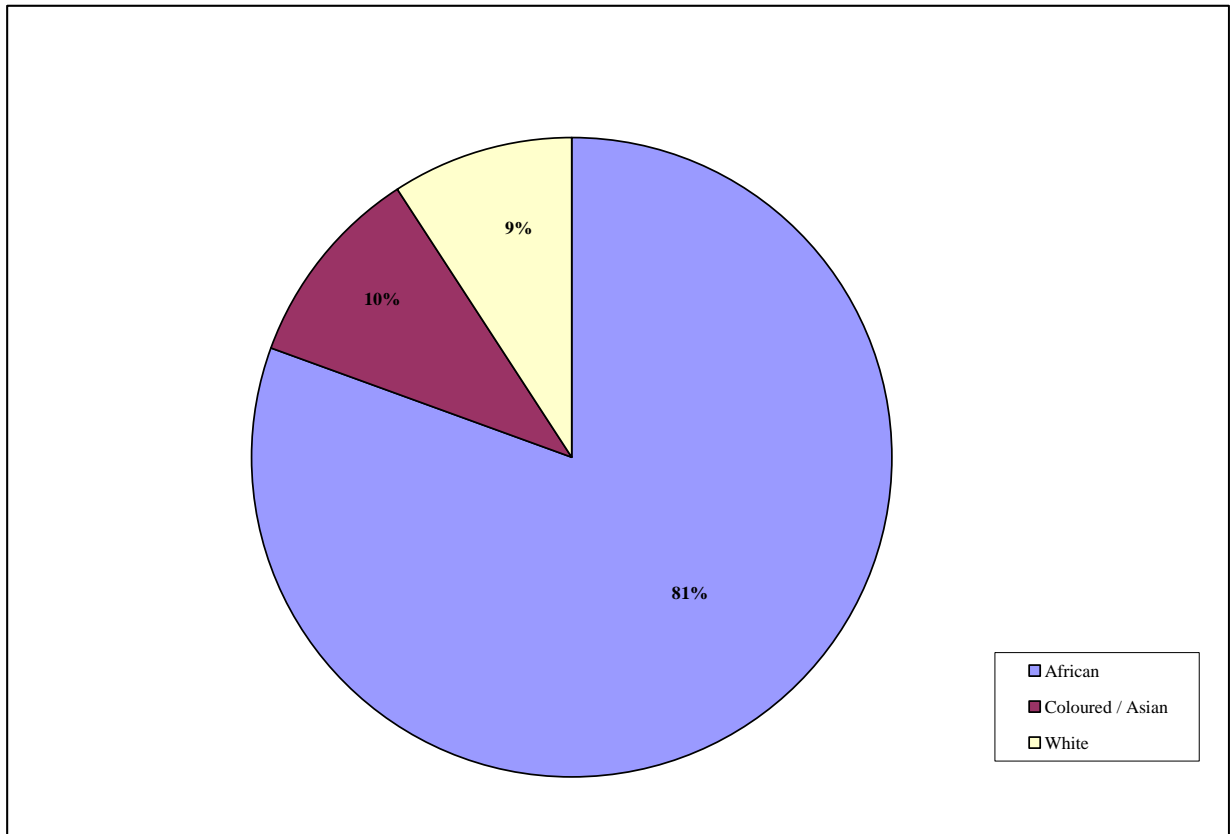
Figure 10 shows the total number of hours per year spent collecting water and fuel for the working age population by household group and gender. Note how it is predominantly only African household groups who must dedicate time to performing this activity. In addition, Figure 10 clearly shows how the burden of water and fuel collection falls primarily on females. Females in ex-homeland African households spend by far the greatest amount of time per year on this particular unpaid activity, at 5 979 hours per year. This is followed by ex-homeland African males and rural commercial African females, who spend a total of 1 605 and 1 440 hours on water and fuel collection respectively.

Figure 10:   Total Hours Spent per Year on Collecting Water and Fuel by Household Group and Gender
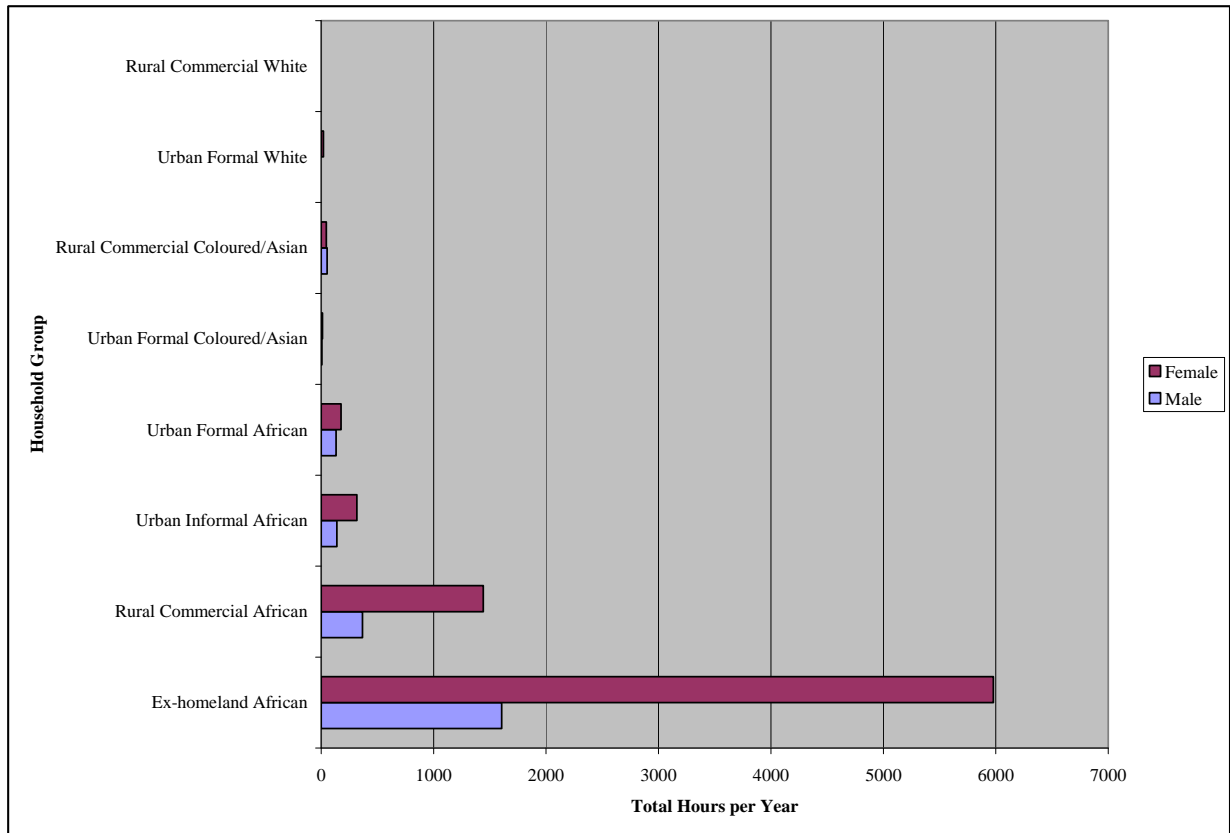
Figure 11 more closely examines the nature of African households time use on water and fuel collection, by incorporating factor groups as well as accounting for each household's income group. The graph confirms a number of expectations. The first of these is that ultra-poor households tend to spend a greater amount of time on this activity than poor or non-poor households do. Secondly, across all household groups, the burden of water and fuel collection falls on the unskilled, particularly unskilled women. However, across all four household groups, unskilled men spend the second highest total amount of time per year on water and fuel collection. Finally, African households in rural commercial or ex-homeland areas spend a greater amount of time on water and fuel collection than African households in urban informal and urban formal areas.

Figure 11:   Total Hours Spent per Year by African Households on Collecting Water and Fuel by Gender
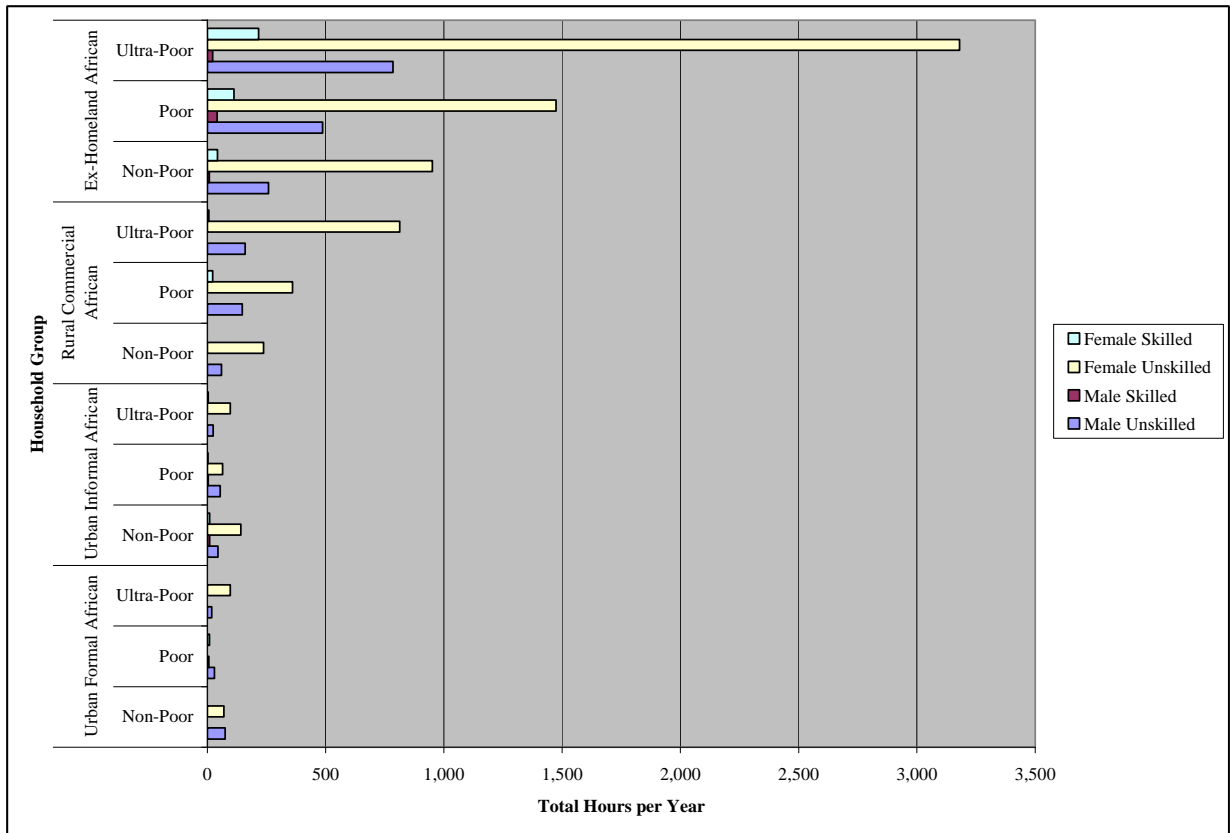
11.   Summary and conclusions

This report provides a technical description of the development of an input-output Social Accounting Matrix (SAM) for South Africa and related satellite accounts for the base year 2000. The report also presents characteristics of representative household and labour groups as it emerges from the Income and Expenditure Survey, the Labour Force Survey and the Time Use Survey, as well as a description of the economic relationships in the South African economy as reflected by the SAM and satellite accounts.

The SAM for South Africa is an input-output SAM with 96 accounts, which can be grouped into 6 broad aggregates – production accounts (26), factors (25), institutions (41), capital (2) and international trade (1). The institutions consist of sub-aggregates – households (36), incorporated enterprises (1) and government (4). The SAM is initially developed as a supply and use SAM and the reduced form input-output SAM is derived as a final stage of the development, using the method of apportionment to eliminate activity accounts while retaining the properties of complete articulation. The result is an input-output SAM with production accounts classified by commodity.

For purposes of the envisaged study with the input-output SAM the focus on the services sector required the disaggregation of the accounts for General Government, and Health and Social Work. The disaggregation could not be carried out satisfactorily; the lack of detailed and accurate data on government services poses immense challenges for detailed analysis of government and social services. The lack of detailed documentation about what really is recorded (as opposed to what should be recorded) in the accounts of the SU-tables compounds the problems that arise when such detailed analysis is attempted.

The household and factor groups of the SAM are formed using data from the combined household Income and Expenditure Survey and the Labour Force Survey conducted by Statistics South Africa in 2000. Household groups are formed around an indicator of the geographical location of the household (rural and urban, with rural split further into 'commercial' and 'ex-homelands', and urban split further into formal and informal areas), the race of the household head (African, Coloured/Asian and White) and a welfare indicator (ultra poor, poor, lower middle income, upper middle income and high income). African households are split into female- and male-headed households. The labour factors in the SAM are split according to province of residence, gender and education level. Three education cohorts are formed, namely people with no education through Grade 10, those with a matric certificate (Grade 12) and those with any form of tertiary qualification (diplomas, certificates or degrees).

In addition to the SAM there are also four satellite accounts compiled from IES/LFS 2000 data. The satellite accounts are sub-matrices of quantities that can be linked to corresponding value sub-matrices of the SAM. The satellite accounts include a) factor use by activity in terms of number of employees, b) factor use by activity in terms of hours worked, c) factor ownership by households in terms of number of employees, and d) factor ownership by households in terms of hours worked. Adjustments to the quantity matrices were attempted to take into account the adjustments as part of the balancing process to the value matrices in the SAM to which the satellite accounts relate. This process clearly indicated that there is a need to adjust both average wages and numbers associated, not just one of the two. It also highlighted that the IES/LFS 2000 does not report sufficient information from which to deduce accurate average wages because the salary information and the time worked does not necessarily correspond to the same period. The satellite account data can best be used to get an indication of average hourly or annual payments, but does not reflect true wage rates. Future research should focus on a method to endogenise the adjustments to the satellite account data as part of the estimation / balancing of the SAM.

The Time Use Survey for 2000 provides information on time spent on both productive and non-productive work. Five of the eight activities identified are productive activities, but non SNA production activities. These include collecting water, collecting fuel, social care, health care and home maintenance and community services. It was found that in order to determine satellite accounts for each of these activities, the high level of disaggregation, namely through the creation of 36 household groups, 24 factor groups, 8 time use classifications, and subsequent categorisation according to labour force status, resulted in problems with sample size. Many cells in the resultant tables had few, if any, observations and this was particularly evident for those tables in which the labour force status was either unemployed or not economically active. The lack of observations made it difficult to make meaningful comparisons across the various household and factor groups regarding their time use patterns.

The input-output SAM is, to the knowledge of the authors, the only input-output SAM for South Africa being derived as a reduced form SAM from a supply and use SAM, using acknowledged apportionment techniques. This SAM is therefore appropriate for use with models based on input-output theory, but at the same time offers additional information available from the supply and use tables. The disaggregation of the service accounts highlighted classification issues with regard to Education that have not been explicit, but which have implications for more in depth analysis of the service sectors. The adjustments to the satellite accounts on employment and hours worked to reflect the adjustments in the SAM as part of the process of balancing the SAM, also present a first step towards endogenising satellite account information in this process in an effort to increase the reliability of these figures.

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13.   Appendix

13.1. Accounts for the Input-Output Social Accounting Matrix for South Africa

Table 42:   Production Accounts (by Commodity)

No.	Short name	Long name	Corresponding use table numbers
1	Cagric	Com Agriculture	C1
2	Cmining	Com Mining	C2_4
3	Cfood	Com Food	C5_16
4	Ctext	Com Textile	C17_25
5	Cpaper	Com Paper and media	C26_31
6	Cpetro	Com Petroleum	C32
7	Cnonmet	Com Non-metallic	C33_48
8	Cmetals	Com Metals	C49_54
9	Cmachin	Com Machinery	C55_72
10	Ccomeq	Com Communication equipment	C73_74
11	Ctrnseq	Com Transport equipment	C75_77
12	Comanuf	Com Other manufacturing	C78_80
13	Celec	Com Electricity	C81
14	Cwater	Com Water	C82
15	Cbuild	Com Buildings	C83
16	Cconstr	Com Other construction	C84
17	Ctradacc	Com Trade and accommodation services	C85_86
18	Ctrnscom	Com Transport and communication services	C87_88
19	Cfinserv	Com Financial services	C89_90
20	Cbusserv	Com Business services	C91_92
21	Ceduc	Com Education	C93a
22	Cogovserv	Com Other government services	C93b
23	Chealth	Com Health care	C94a
24	Csocial	Com Social care	C94b
25	Coserv	Com Other services	C95
26	Cdomserv	Com Domestic services	

Table 43:   Household Accounts

No.	Household accounts	Household accounts
1	HUF_Af1	Urban formal African high income
2	HUF_Af2	Urban formal African upper mid income
3	HUF_Af3	Urban formal African lower mid income
4	HUF_Af4	Urban formal African poor
5	HUF_Af5	Urban formal African ultra poor
6	HUF_Co1	Urban formal Coloured and Asian high income
7	HUF_Co2	Urban formal Coloured and Asian upper mid income
8	HUF_Co3	Urban formal Coloured and Asian lower mid income
9	HUF_Co4	Urban formal Coloured and Asian poor
10	HUF_Co5	Urban formal Coloured and Asian ultra poor
11	HUF_Wh1	Urban formal White high income
12	HUF_Wh2	Urban formal White upper mid income
13	HUF_Wh3	Urban formal White lower mid income
14	HUI_Af1	Urban informal African high income
15	HUI_Af2	Urban informal African upper mid income
16	HUI_Af3	Urban informal African lower mid income
17	HUI_Af4	Urban informal African poor
18	HUI_Af5	Urban informal African ultra poor
19	HRF_Af1	Rural commercial African high income
20	HRF_Af2	Rural commercial African upper mid income
21	HRF_Af3	Rural commercial African lower mid income
22	HRF_Af4	Rural commercial African poor
23	HRF_Af5	Rural commercial African ultra poor
24	HRF_Co1	Rural commercial Coloured and Asian high income
25	HRF_Co2	Rural commercial Coloured and Asian upper mid income
26	HRF_Co3	Rural commercial Coloured and Asian lower mid income
27	HRF_Co4	Rural commercial Coloured and Asian poor
28	HRF_Co5	Rural commercial Coloured and Asian ultra poor
29	HRF_Wh1	Rural commercial White high income
30	HRF_Wh2	Rural commercial White upper mid income
31	HRF_Wh3	Rural commercial White lower mid income
32	HRI_Af1	Ex homeland African high income
33	HRI_Af2	Ex homeland African upper mid income
34	HRI_Af3	Ex homeland African lower mid income
35	HRI_Af4	Ex homeland African poor
36	HRI_Af5	Ex homeland African ultra poor

Table 44:   Factor Accounts

No.	Factor accounts	Factor accounts[1]
1	FGOS	Gross Operating Surplus
2	FWest1	West Coast male none to GET
3	FWest2	West Coast male matric
4	FWest3	West Coast male tertiary
5	FWest4	West Coast female none to GET
6	FWest5	West Coast female matric
7	FWest6	West Coast female tertiary
8	FEast1	East Coast male none to GET
9	FEast2	East Coast male matric
10	FEast3	East Coast male tertiary
11	FEast4	East Coast female none to GET
12	FEast5	East Coast female matric
13	FEast6	East Coast female tertiary
14	FCent1	Central male none to GET
15	FCent2	Central male matric
16	FCent3	Central male tertiary
17	FCent4	Central female none to GET
18	FCent5	Central female matric
19	FCent6	Central female tertiary
20	FBord1	Border male none to GET
21	FBord2	Border male matric
22	FBord3	Border male tertiary
23	FBord4	Border female none to GET
24	FBord5	Border female matric
25	FBord6	Border female tertiary

[1] Factors are classified by four regions of South Africa, which captures all nine provinces in the country: West Coast - Western Cape and Northern Cape Provinces; East Coast – Eastern Cape and KwaZulu-Natal; Central – Gauteng, Free State and North West; Border – Mpumalanga and Limpopo.

Table 45:   Other SAM Accounts

No.	Other Accounts	Other Accounts (continued)
1	Saltax	Net sales taxes
2	Indtax	Net production taxes
3	Dirtax	Direct income taxes
4	Govt	Government
5	Ent	Business Enterprises
6	Kap	Savings
7	Dstoc	Stock Changes
8	Row	Rest of the World
9	Total	Account totals

Table 46:   SIC description for production accounts in the SU-tables of South Africa

Col. no.	SU-tables description	Corresponding SIC (Standard Industrial Classification, fifth edition) - groups
I1	Agriculture	1110, 1120, 1130, 1140, 1150, 1160, 1210, 1220, 1310, 1320
I2	Coal	2100
I3	Gold	2300
I4	Other mining	2210, 2410, 2420, 2510, 2520, 2530, 2900
I5	Meat	3011
I6	Fish	3012
I7	Fruit	3013
I8	Oils	3014
I9	Dairy	3020
I10	Grain mills	3031, 3032
I11	Animal feeds	3033
I12	Bakeries	3041
I13	Sugar	3042
I14	Confectionery	3043
I15	Other food	3044, 3049
I16	Beverages & tobacco	3051, 3052, 3053, 3060
I17	Textiles	3111, 3112
I18	Textile articles	3121
I19	Carpets	3122
I20	Other textiles	3123, 3129
I21	Knitting mills	3130
I22	Wearing apparel	3140, 3150
I23	Leather	3161
I24	Handbags	3162
I25	Footwear	3170
I26	Wood	3210, 3221, 3222, 3223, 3229
I27	Paper	3231
I28	Containers of paper	3232
I29	Other paper	3239
I30	Publishing	3241, 3242, 3249, 3251, 3252
I31	Recorded media	3243, 3260
I32	Petroleum	3310, 3321, 3322, 3323, 3324, 3325, 3329, 3330
I33	Basic chemicals	3341
I34	Fertilizers	3342
I35	Primary plastics	3343, 3360
I36	Pesticides	3351
I37	Paints	3352
I38	Pharmaceuticals	3353
I39	Soap	3354
I40	Other chemicals	3359
I41	Tyres	3371
I42	Other rubber	3379
I43	Plastic	3380
I44	Glass	3411
I45	Non-structural ceramics	3421
I46	Structural ceramics	3422, 3423
I47	Cement	3424
I48	Other non-metallic	3425, 3426, 3429
I49	Iron and steel	3510, 3531
I50	Non-ferrous metals	3520, 3532
I51	Structural metal	3541, 3542, 3543
I52	Treated metals	3551, 3552

Col. no.	SU-tables description	Corresponding SIC (Standard Industrial Classification, fifth edition) - groups
I53	General hardware	3553
I54	Fabricated metal	3559
I55	Engines	3561
I56	Pumps	3562
I57	Gears	3563
I58	Lifting equipment	3565
I59	General machinery	3564, 3569
I60	Agricultural machinery	3571
I61	Machine-tools	3572
I62	Mining machinery	3574
I63	Food machinery	3575
I64	Special machinery	3573, 3576, 3577, 3579
I65	Household appliances	3580
I66	Office machinery	3590
I67	Electric motors	3610
I68	Electricity apparatus	3620
I69	Wire and cable	3630
I70	Accumulators	3640
I71	Lighting equipment	3650
I72	Electrical equipment	3660
I73	Radio and television	3710, 3720, 3730
I74	Optical instruments	3741, 3742, 3743, 3750, 3760
I75	Motor vehicles	3810, 3820
I76	Motor vehicle parts	3830
I77	Other transport	3841, 3842, 3850, 3860, 3871, 3872, 3879
I78	Furniture	3910
I79	Jewellery	3921
I80	Other manufacturing	3922, 3923, 3924, 3929, 3951, 3952
I81	Electricity	4110, 4120, 4130
I82	Water	4200
I83	Buildings	5021, 5024, 5031, 5032, 5033, 5039, 5041, 5049
I84	Other construction.	5010, 5022, 5023, 5050
I85	Trade	6110, 6120, 6130, 6140, 6150, 6190, 6210, 6220, 6230, 6240, 6250, 6260, 6310, 6320, 6330, 6340, 6350
I86	Hotels	6410, 6420
I87	Transport services	7110, 7120, 7130, 7210, 7220, 7300, 7410
I88	Communications	7510, 7520
I89	Financial intermediation services indirectly measured	
I90	Insurance	8110, 8190, 8210, 8310, 8320
I91	Real estate	8410, 8420
I92	Business activities	8510, 8520, 8530, 8610, 8620, 8630, 8640, 8650, 8690, 8710, 8720, 8810, 8820, 8830, 8890
I93	General government	9110, 9120, 9130, 9400
I94	Health and social work	9311, 9312, 9319, 9320, 9330
I95	Activities/services	9200, 9500, 9600, 9900, 0200, 0900

13.2. Phase configuration mappings

Notes: Only mappings that represent disaggregation are shown. S9 refers to accounts at nine-sector level.

Table 47:   Phase configuration mappings used during SAM estimation

Phase	Macro Accounts	Micro Accounts
Phase1	CALL - All Commodities	S9CAG - S9: Agriculture, forestry and fishing
		S9CMIN - S9: Mining and quarrying
		S9CMAN - S9: Manufacturing
		S9CUT - S9: Electricity, gas and water
		S9CCON - S9: Construction
		S9CTACC - S9: Trade, catering, accommodation
		S9CTCOM - S9: Transport communication
		S9CFIN - S9: Finance business services
		S9CGOV - S9: Other services
	AALL - All Activities	S9AAG - S9: Agriculture, forestry and fishing
		S9AMIN - S9: Mining and quarrying
		S9AMAN - S9: Manufacturing
		S9AUT - S9: Electricity, gas and water
		S9ACON - S9: Construction
		S9ATACC - S9: Trade, catering, accommodation
		S9ATCOM - S9: Transport communication
		S9AFIN - S9: Finance business services
		S9AGOV - S9: Other services
Phase2	MALL - All Margins	M1 - Trade margin
		M2 - Transport margin
	LABALL - All Labour	FLWC - Labour Western Cape
		FLEC - Labour Eastern Cape
		FLNC - Labour Northern Cape
		FLFS - Labour Free State
		FLKZ - Labour KwaZulu-Natal
		FLGT - Labour Gauteng
		FLNW - Labour North West
		FLMP - Labour Mpumalanga
		FLLP - Labour Limpopo Province
	HALL - All Households	HUFAF - HH Urban Formal African
		HUFCA - HH Urban Formal Col Asian
		HUFWH - HH Urban Formal White
		HIFAF - HH Urban Informal African
		HRCAF - HH Rural African
		HRCCA - HH Rural Col Asian
		HRCWH - HH Rural White
		HEXAF - HH Ex Homelands African
	S9CAG - S9: Agriculture, forestry and fishing	C1 - Agriculture, forestry and fishing
	S9CMIN - S9: Mining and quarrying	C2 - Coal and lignite products
		C3 - Gold and uranium ore products
		C4a - Crude oil products
		C4b - Other mining products
	S9CMAN - S9: Manufacturing	C5 - Meat products
		C6 - Fish products

Phase	Macro Accounts	Micro Accounts
		C7 - Fruit and vegetables products
		C8 - Oils and fats products
		C9 - Dairy products
		C10 - Grain mill products
		C11 - Animal feeds
		C12 - Bakery products
		C13 - Sugar products
		C14 - Confectionery products
		C15 - Other food products
		C16 - Beverages and tobacco products
		C17 - Textile products
		C18 - Made-up textile products
		C19 - Carpets
		C20 - Other textile products
		C21 - Knitting mill products
		C22 - Wearing apparel
		C23 - Leather products
		C24 - Handbags
		C25 - Footwear
		C26 - Wood products
		C27 - Paper products
		C28 - Containers of paper
		C29 - Other paper products
		C30 - Published and printed products
		C31 - Recorded media products
		C32 - Petroleum products
		C33 - Basic chemical products
		C34 - Fertilizers
		C35 - Primary plastic products
		C36 - Pesticides
		C37 - Paints
		C38 - Pharmaceutical products
		C39 - Soap products
		C40 - Other chemical products
		C41 - Rubber tyres
		C42 - Other rubber products
		C43 - Plastic products
		C44 - Glass products
		C45 – Ceramic ware
		C46 - Ceramic products
		C47 - Cement
		C48 - Other non-metallic products
		C49 - Iron and steel products
		C50 - Non-ferrous metals
		C51 - Structural metal products
		C52 - Treated metal products
		C53 - General hardware products
		C54 - Other fabricated metal products
		C55 - Engines
		C56 - Pumps
		C57 - Gears
		C58 - Lifting equipment
		C59 - General machinery
		C60 - Agricultural machinery
		C61 - Machine-tools
		C62 - Mining machinery
		C63 - Food machinery

Phase	Macro Accounts	Micro Accounts
		C64 - Other special machinery
		C65 - Household appliances
		C66 - Office machinery
		C67 - Electric motors
		C68 - Electricity apparatus
		C69 - Wire and cable products
		C70 - Accumulators
		C71 - Lighting equipment
		C72 - Other electrical products
		C73 - Radio and television products
		C74 - Optical instruments
		C75 - Motor vehicles
		C76 - Motor vehicles parts
		C77 - Other transport products
		C78 - Furniture
		C79 - Jewellery
		C80 - Other manufacturing
	S9CUT - S9: Electricity, gas and water	C81 - Electricity
		C82 - Water
	S9CCON - S9: Construction	C83 - Buildings
		C84 - Other constructions
	S9CTACC - S9: Trade, catering, accommodation	C85 - Trade services
		C86 - Accommodation
	S9CTCOM - S9: Transport communication	C87 - Transport services
		C88 - Communications
	S9CFIN - S9: Finance business services	C89 - FSIM
		C90 - Insurance services
		C91 - Real estate services
		C92 - Other business services
	S9CGOV - S9: Other services	C93 - General Government services
		C94 - Health and social work
		C95 - Other services and activities
		C96 - Domestic services
	S9AAG - S9: Agriculture, forestry and fishing	A1a - All Agriculture
		A1b - Forestry
		A1c - Fishing
	S9AMIN - S9: Mining and quarrying	A2 - Coal
		A3 - Gold
		A4 - Other mining
	S9AMAN - S9: Manufacturing	A5 - Meat
		A6 - Fish
		A7 - Fruit
		A8 - Oils
		A9 - Dairy
		A10 - Grain mills
		A11 - Animal feeds
		A12 - Bakeries
		A13 - Sugar
		A14 - Confectionery
		A15 - Other food
		A16 - Beverages and tobacco
		A17 - Textiles
		A18 - Textile articles
		A19 - Carpets
		A20 - Other textiles

Phase	Macro Accounts	Micro Accounts
		A21 - Knitting mills
		A22 - Wearing apparel
		A23 - Leather
		A24 - Handbags
		A25 - Footwear
		A26 - Wood
		A27 - Paper
		A28 - Containers of paper
		A29 - Other paper
		A30 - Publishing
		A31 - Recorded media
		A32 - Petroleum
		A33 - Basic chemicals
		A34 - Fertilizers
		A35 - Primary plastics
		A36 - Pesticides
		A37 - Paints
		A38 - Pharmaceuticals
		A39 - Soap
		A40 - Other chemicals
		A41 - Tyres
		A42 - Other Rubber
		A43 - Plastic
		A44 - Glass
		A45 - Non-structural ceramics
		A46 - Structural ceramics
		A47 - Cement
		A48 - Other non-metallic
		A49 - Iron and steel
		A50 - Non-ferrous metals
		A51 - Structural metal
		A52 - Treated metals
		A53 - General hardware
		A54 - Fabricated metal
		A55 - Engines
		A56 - Pumps
		A57 - Gears
		A58 - Lifting equipment
		A59 - General machinery
		A60 - Agricultural machinery
		A61 - Machine-tools
		A62 - Mining machinery
		A63 - Food machinery
		A64 - Special machinery
		A65 - Household appliances
		A66 - Office machinery
		A67 - Electric motors
		A68 - Electricity apparatus
		A69 - Wire and cable
		A70 - Accumulators
		A71 - Lighting equipment
		A72 - Electrical equipment
		A73 - Radio and television
		A74 - Optical instruments
		A75 - Motor vehicles
		A76 - Motor vehicle parts
		A77 - Other Transport

Phase	Macro Accounts	Micro Accounts
		A78 - Furniture
		A79 - Jewellery
		A80 - Other manufacturing
	S9AUT - S9: Electricity, gas and water	A81 - Electricity
		A82 - Water
	S9ACON - S9: Construction	A83 - Buildings
		A84 - Other construction
	S9ATACC - S9: Trade, catering, accommodation	A85 - Trade
		A86 - Accommodation
	S9ATCOM - S9: Transport communication	A87 - Transport services
		A88 - Communications
	S9AFIN - S9: Finance business services	A89 - Insurance
		A90 - Real estate
		A91 - Business activities
	S9AGOV - S9: Other services	A92 - General Government
		A93 - Health and social work
		A94 - Activities and services
		A95 - Domestic services
Phase3	FLEC - Labour Eastern Cape	FL7 - Eastern Cape male none to GET
		FL8 - Eastern Cape male matric
		FL9 - Eastern Cape male tertiary
		FL10 - Eastern Cape female none to GET
		FL11 - Eastern Cape female matric
		FL12 - Eastern Cape female tertiary
	FLFS - Labour Free State	FL19 - Free State male none to GET
		FL20 - Free State male matric
		FL21 - Free State male tertiary
		FL22 - Free State female none to GET
		FL23 - Free State female matric
		FL24 - Free State female tertiary
	FLGT - Labour Gauteng	FL37 - Gauteng male none to GET
		FL38 - Gauteng male matric
		FL39 - Gauteng male tertiary
		FL40 - Gauteng female none to GET
		FL41 - Gauteng female matric
		FL42 - Gauteng female tertiary
	FLKZ - Labour KwaZulu-Natal	FL25 - KwaZulu-Natal male none to GET
		FL26 - KwaZulu-Natal male matric
		FL27 - KwaZulu-Natal male tertiary
		FL28 - KwaZulu-Natal female none to GET
		FL29 - KwaZulu-Natal female matric
		FL30 - KwaZulu-Natal female tertiary
	FLLP - Labour Limpopo Province	FL49 - Limpopo male none to GET
		FL50 - Limpopo male matric
		FL51 - Limpopo male tertiary
		FL52 - Limpopo female none to GET
		FL53 - Limpopo female matric
		FL54 - Limpopo female tertiary
	FLMP - Labour Mpumalanga	FL43 - Mpumalanga male none to GET
		FL44 - Mpumalanga male matric
		FL45 - Mpumalanga male tertiary
		FL46 - Mpumalanga female none to GET
		FL47 - Mpumalanga female matric
		FL48 - Mpumalanga female tertiary
	FLNC - Labour Northern Cape	FL13 - Northern Cape male none to GET

Phase	Macro Accounts	Micro Accounts
		FL14 - Northern Cape male matric
		FL15 - Northern Cape male tertiary
		FL16 - Northern Cape female none to GET
		FL17 - Northern Cape female matric
		FL18 - Northern Cape female tertiary
	FLNW - Labour North West	FL31 - North West male none to GET
		FL32 - North West male matric
		FL33 - North West male tertiary
		FL34 - North West female none to GET
		FL35 - North West female matric
		FL36 - North West female tertiary
	FLWC - Labour Western Cape	FL1 - Western Cape male none to GET
		FL2 - Western Cape male matric
		FL3 - Western Cape male tertiary
		FL4 - Western Cape female none to GET
		FL5 - Western Cape female matric
		FL6 - Western Cape female tertiary
	HEXAF - HH Ex Homelands African	H47 - Ex homeland African ultra poor male
		H48 - Ex homeland African ultra poor female
		H49 - Ex homeland African poor male
		H50 - Ex homeland African poor female
		H51 - Ex homeland African lower mid income male
		H52 - Ex homeland African lower mid income female
		H53 - Ex homeland African upper mid income male
		H54 - Ex homeland African upper mid income female
		H55 - Ex homeland African high income male
		H56 - Ex homeland African high income female
	HIFAF - HH Urban Informal African	H19 - Urban informal African ultra poor male
		H20 - Urban informal African ultra poor female
		H21 - Urban informal African poor male
		H22 - Urban informal African poor female
		H23 - Urban informal African lower mid income male
		H24 - Urban informal African lower mid income female
		H25 - Urban informal African upper mid income male
		H26 - Urban informal African upper mid income female
		H27 - Urban informal African high income male
		H28 - Urban informal African high income female
	HRCAF - HH Rural African	H29 - Rural commercial African ultra poor male
		H30 - Rural commercial African ultra poor female
		H31 - Rural commercial African poor male
		H32 - Rural commercial African poor female
		H33 - Rural commercial African lower mid income male
		H34 - Rural commercial African lower mid income female
		H35 - Rural commercial African upper mid income male

Phase	Macro Accounts	Micro Accounts
		H36 - Rural commercial African upper mid income female
		H37 - Rural commercial African high income male
		H38 - Rural commercial African high income female
	HRCCA - HH Rural Col Asian	H43 - Rural commercial Coloured and Asian high income
		H39 - Rural commercial Coloured and Asian ultra poor
		H40 - Rural commercial Coloured and Asian poor
		H41 - Rural commercial Coloured and Asian lower mid income
		H42 - Rural commercial Coloured and Asian upper mid income
	HRCWH - HH Rural White	H44 - Rural commercial White lower mid income
		H45 - Rural commercial White upper mid income
		H46 - Rural commercial White high income
	HUFAF - HH Urban Formal African	H1 - Urban formal African ultra poor male
		H2 - Urban formal African ultra poor female
		H3 - Urban formal African poor male
		H4 - Urban formal African poor female
		H5 - Urban formal African lower mid income male
		H6 - Urban formal African lower mid income female
		H7 - Urban formal African upper mid income male
		H8 - Urban formal African upper mid income female
		H9 - Urban formal African high income male
		H10 - Urban formal African high income female
	HUFCA - HH Urban Formal Col Asian	H11 - Urban formal Coloured and Asian ultra poor
		H12 - Urban formal Coloured and Asian poor
		H13 - Urban formal Coloured and Asian lower mid income
		H14 - Urban formal Coloured and Asian upper mid income
		H15 - Urban formal Coloured and Asian high income
	HUFWH - HH Urban Formal White	H16 - Urban formal White lower mid income
		H17 - Urban formal White upper mid income
		H18 - Urban formal White high income